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Compensatory Mitigation Requirements for Stream Impacts in the State of Ohio

Woodiebrook, a restored native brook trout stream in Geauga County (photo: Paul Anderson, Ohio EPA)

Ohio EPA Division of Surface Water
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PREFACE

This document was authored by Paul Anderson (DSW-NEDO) as part of the stream mitigation rule work group effort. Other members of the stream mitigation work group include Randy Bournique (DSW), Mike Smith (DSW), Dan Dudley (DSW), Marc Smith (DSW-EAU), Bill Fischbein (Legal), Peter Simcic (Legal), and Tom Harcarik (DEFA). Additional input was provided by the following individuals: Dan Mecklenburg and John Matthews (ODNR, DSWC), Randy Sanders (ODNR, DOW), and Tom Linkous and Donald Rostofer (ODOT). This document was developed for discussion purposes only, and should not be cited, quoted, or used in a regulatory context in any way at this time. The exclusive purpose of this draft is to solicit internal Ohio EPA comments. Following an internal review and revision, this document may be provided to the public for external review. Any questions regarding the content of this document should be directed to Paul Anderson [330-963-1228]. Questions with respect to the use or regulatory future of this document should be directed to Dan Dudley [614-644-2876] or Randy Bournique [614-644-2013] of the Division of Surface Water.

Executive Summary: Compensatory Mitigation Requirements for Stream Impacts in the State of Ohio

The Division of Surface Water of the Ohio EPA is responsible for the administration of the Water Quality Certification requirements specified by Section 401 of the Clean Water Act. This portion of federal law specifies that the U.S. Army Corps of Engineers cannot issue a permit for the placement of dredge or fill material into waters of the United States unless the state issues a certification that the authorized activity will not significantly degrade water quality. Ohio EPA promulgated rules in 1998 regarding anti-degradation and mitigation requirements for the processing of Section 401 Water Quality Certification applications for wetlands. However, no rule or policy currently exists relating specifically to the processing or evaluation of Section 401 applications with respect to impact on stream ecosystems except for the general requirements of the anti-degradation rule (OAC Rule 3745-1-05) and provisions in Ohio Law (ORC Chapter 6111).

The development of compensatory mitigation plans for projects which qualify for approval under the Section 401 State Water Quality Certification program is a critical part of the application process. Mitigation projects are required in order to ensure that there is no net loss of existing stream uses, water quality functions of the stream, or overall integrity of the aquatic resource. Currently, the Ohio EPA typically requires that mitigation be conducted at a ratio ranging from 1.5:1 to 3:1 of mitigation:impact on a linear foot basis (measured as stream channel length). Although the use of this mitigation ratio model for the determination of appropriate mitigation requirements appears to be simple, actual implementation has proved to be quite difficult for both the agency and the regulated community. The reason for this is that projects relating to stream ecosystems which are subject to Section 401 Water Quality Certification and antidegradation review vary widely with respect to types of impacts and severity, and there is an inherent difficulty in matching proposed impacts to proposed mitigation on a foot by foot basis.

This document has been developed to provide a uniform methodology for weighting impacts to stream ecosystems and for the comparison of these impacts to associated mitigation proposals included in the 401 Water Quality Certification application. The intent of the procedures described in this document is to provide a framework which will provide predictability and consistency for the development, review, and approval of compensatory mitigation plans associated with Section 401 Water Quality Certification applications for impacts to streams, and to ensure that no net loss of stream uses or functions occurs through the process. The procedures describe the use of a weighting factor method for quantifying impacts and mitigation benefits under a credit system rather than through the use of traditional approaches which based all evaluations solely upon stream lengths impacted or mitigated. It should be noted that nothing within these procedures would exempt any application, regardless of the degree of mitigation proposed, from the anti-degradation requirements found in OAC Chapter 3745-1 or

other applicable rules regarding avoidance, minimization, or the protection of existing uses for Waters of the State as required by ORC Chapter 6111.

The weighting factors selected for use assign scaled values for various aspects of stream use designations (the stream's status under a regulatory context) and stream characteristics (the stream's condition based upon actual data) which can be used to assess the integrity of the impacted or mitigated stream segments. The weighting methodology is patterned after procedures developed by the Savannah District of the U.S. Army Corps of Engineers (USACE, 2000) which use relative scaling of impacts and proposed mitigation projects in order to determine if compensatory mitigation proposals in applications for Section 404 permits for stream impacts are appropriate. This procedure has been modified to reflect regulatory requirements for the State of Ohio for the issuance of Section 401 Water Quality Certifications and to assure consistency with the U.S. Army Corps of Engineers Regulatory Guidance Letter dated December 24, 2002 (USACE, 2002). The scaling of weighting factors for assessing stream impacts and mitigation proposals have been adjusted to encourage avoidance or minimization of impacts and the design of high quality mitigation projects through the scoring process. Through the use of appropriate, well designed stream mitigation projects, the overall impact to water quality from unavoidable impacts can be lessened dramatically.

Weighting factors used in the evaluation of impacts and compensatory mitigation proposals and the associated scoring ranges were selected to reflect measurements of existing stream uses as designated or defined in the Ohio Water Quality Standards (OAC Chapter 3745-1) or as quantified using existing methodologies for assessing use attainability and stream integrity. Six weighting factors are used to assess proposed impact, and twelve factors are used to assess mitigation proposals (see Table ES 1). Some mitigation factors may not apply in certain mitigation scenarios as described in the document. Values were assigned to each weighting factor based upon several considerations relating to stream resource integrity in order to provide an integrated measure of the value of the resource being impacted, restored, or protected through the Section 401 Water Quality Certification process. These factors include the rarity and quality of the types of stream ecosystems represented by aquatic life use designations, measurements of habitat quality, biological and geomorphic integrity, and other factors which can be used to denote stream quality such as the presence of endangered, threatened or rare species, and the quality of the floodplain and wooded riparian zone.

After the assignment of weighting factor scores for impact categories and for the proposed mitigation projects, they are summed and the resulting number is multiplied by the linear feet of impact or mitigation activity to provide a total number of impact debits or mitigation credits applicable to a proposed project. Where impacts or mitigation will occur along separate stream reaches or different streams, debits or mitigation credits for each impact or mitigation project are scored separately and the results pooled in order to complete the evaluation. Final calculated mitigation credits need to equal or exceed the calculated debits for the project in order to be acceptable.

Table ES1. Summary of Weighting Factors and scoring ranges for evaluating stream impacts and compensatory mitigation requirements.

Weighting Factor	Weighting Factor Score Ranges	
	Adverse Impact Weighting Factors (Form A)	**Stream Mitigation Weighting Factors Table (Form B)**
Existing or Resulting Aquatic Life Use	1.5 - 3.2[a]	0.1 - 1.0 Relocation 0.6 - 1.0 Restoration or Preservation
Existing or Resulting Habitat Quality	0.2 - 1.5	0.1 - 1.0 Relocation 0.5 - 1.0 Restoration or Preservation
Priority Area	0.1 - 1.0	0.0 - 0.5
Existing Geomorphic Integrity	0.2 - 1.5	NA
Existing Floodplain Quality	0.2 - 1.5	NA
Impact Category	0.2 - 2.0	NA
Stream Channel Restoration/ Relocation Design	NA	0.0 Preservation Only Projects 0.5 - 3.0 Relocation Projects 1.0 - 3.0 Restoration Projects
Riparian/Floodplain Preservation	NA	0.0 - 1.0 Relocation Projects 0.2 - 1.0 Preservation and Restoration Projects
Riparian Restoration and Enhancement	NA	0.0 - 1.0
Watershed Location	NA	0.0 - 1.0
Control	NA	0.0 - 0.5
Impact/Mitigation Relationship	NA	0.1 - 0.5
Implementation Schedule	NA	-0.1 - 0.3
Supplemental Water Quality Activities	NA	0.0 - 0.3
Threat to Stream Segment	NA	NA Relocation Projects 0.0 - 0.3 Preservation and Restoration Projects
Weighting Factor Range	**2.4 - 12.2**	**1.3 - 7.4 Preservation** **0.7 - 9.8 Relocation** **2.3 - 10.4 Restoration**

[a]Default scoring criteria or mitigation requirements may apply, see Section 5.2.1.3

Scores for each weighting factor were adjusted so that under an "average case" scenario, the ratio of calculated impact credits using the impact analysis procedure would roughly equal 1.5 times the calculated mitigation credits using the mitigation evaluation procedures for a similar set of conditions under stream restoration and relocation scenarios. This number was selected because a mitigation ratio of 1.5 : 1 has historically been used for most stream projects under the 401 review process. Mitigation ratios for preservation projects have historically been higher than those required for stream restoration, although there has been no set policy in this regard. In the construction of this protocol, it has been recognized that stream preservation projects tend to be a much less expensive mitigation alternative which in many cases does not replace the resource or function being lost through the approval of a permit through the Section 404/Section 401 review process. Therefore, the target "mitigation ratio" for preservation activities has been designed to be higher than that granted for stream restoration activities, and some limits are proposed regarding the use of stream preservation as compensatory mitigation for larger scale projects.

The document encourages applicants to utilize procedures for the classification of Primary Headwater Habitat (PHWH) streams, where appropriate, as part of the mitigation evaluation process. The use of these procedures is only applicable for situations where there is no existing aquatic life use designation for the stream segment in question listed in OAC Chapter 3745-1, and where the watershed area upstream is less than 1 mi^2 and permanent pools are less than 40 cm in depth. The use of these procedures is incorporated into the weighting factor system, and provides both the applicants and the agency with a better process for dealing with small, undesignated headwater streams in the Section 401 context.

To further simplify the review process, the weighting factor evaluation procedure is not used for streams designated under the Limited Resource Water (LRW), Modified Warmwater Habitat (MWH), and Limited Warmwater Habitat (LWH) aquatic life use designations, or for undesignated streams found to meet the definition for these uses based upon a use attainability analysis. Instead, alternative mitigation requirements for the protection of downstream uses through post-construction best management practices and other appropriate measures are proposed for Class I PHWH and LRW streams. A default impact weighting factor is proposed for use for impacts to Class II PHWH, MWH and LWH streams.

The debit/credit weighting protocol also includes provisions to provide mitigation credits for important supplemental water quality projects which formally could not be given credit. These additional credits can be earned through the addition of activities to improve water quality which do not include stream restoration or preservation activities but will result in improvements in water quality by other means. For some temporary impacts that require a 401 Water Quality Certification, a water quality improvement project may be eligible to provide all of the mitigation credits required. The protocol has also been designed to recognize that in many stream restoration scenarios, especially

those in which dams and other rigid engineered structures are removed from streams, there is a high probability that additional benefits will be realized upstream and downstream of the stream segment directly altered by the restoration activity. The document provides a mechanism to allow for the calculation of mitigation credits associated with these collateral benefits on a case-by case basis where these benefits can be accurately predicted. To obtain these additional credits, the applicant would need to provide sufficient biological, and physical site data documentation in the mitigation proposal to justify the credit allocation.

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

TABLE OF CONTENTS (cont.)

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION AND APPLICABILITY:

This stream mitigation document has been developed to evaluate impacts to stream ecosystems within the State of Ohio which are the subject of an application for a State Water Quality Certification under Section 401 of the Clean Water Act and Chapter 3545-1 of the Ohio Administrative Code (OAC) and the associated proposals for compensatory mitigation accompanying these applications. The federal Clean Water Act (Public Law 92-500), as amended, states that its primary objective is to "...restore and maintain the chemical, physical, and biological integrity of the Nation's waters." This objective is echoed in Ohio's Water Quality Criteria, which state that the purpose of the criteria is to "...establish minimum water quality requirements for all surface waters of the state, thereby protecting public health and welfare; and to enhance, improve and maintain water quality as provided under the laws of the State of Ohio, section 6111.041 of the Revised Code, the federal Clean Water Act, 33 U.S.C. section 1251 et seq., and rules adopted thereunder" [Ohio Administrative Code 3745-1-01 (A)]. According to the federal Clean Water Act, anyone who wishes to discharge dredged or fill material into the waters of the U.S., regardless of whether on private or public property, must obtain a Section 404 permit from the U.S. Army Corps of Engineers (Corps of Engineers) and a Section 401 Water Quality Certification from the State of Ohio. Responsibility for the processing of applications for Section 401 Water Quality Certifications rests with the Ohio EPA Division of Surface Water.

The intent of this document is to promote discussion regarding a new framework, which will provide predictability and consistency for the development, review, and approval of compensatory mitigation plans associated with Section 401 Water Quality Certification applications for impacts to streams. A key element of this proposal is the use of a weighting method for calculating mitigation credits. The weighting methodology is patterned after procedures developed by the Savannah District of the Corps of Engineers (USACE, 2000) which use relative scaling of impacts and proposed mitigation projects in order to determine if compensatory mitigation proposals in applications for Section 404 permits for stream impacts are appropriate. This procedure has been modified to reflect regulatory requirements for the State of Ohio for the issuance of Section 401 Water Quality Certifications.

The conceptual proposal discussed in this document is just that - a proposal. It is recognized that in order to effectuate this concept, Ohio EPA must engage in rule making. Should these concepts be adopted in rule, it should be made clear that while this methodology is not intended for use as project design criteria, appropriate application of the methodology should minimize uncertainty in the development and approval of mitigation plans and allow expeditious review of applications. However, nothing in this concept should be interpreted as a promise or guarantee that a project which satisfies the criteria or guidelines would be assured of a permit. The Director

has a responsibility to consider each project on a case-by-case basis and may determine in any specific situation that a State Water Quality Certification should be denied, modified, suspended, or revoked. In addition, nothing within these procedures should be construed to exempt any application, regardless of the degree of mitigation proposed, from the anti-degradation requirements found in OAC Chapter 3745-1 or other applicable rules regarding avoidance, minimization, or the protection of existing uses for Waters of the State as required by ORC Chapter 6111. This stream mitigation document does not address mitigation for non-ecological characteristics such as impacts to the historical, cultural or aesthetic characteristics of a stream which may be regulated under other applicable authorities.

The Ohio EPA does not intend to require the use of any specific methodology, technology or technique in the development, design or implementation of stream mitigation projects. Instead, applicants who are required to develop stream mitigation plans are encouraged to use sound ecological and engineering principles based upon state of the art knowledge in the development of their plans. It is recognized that the science behind stream assessment, protection and restoration methodologies is constantly evolving. In addition, it is also recognized that the availability of locations for compensatory mitigation projects is variable state-wide and that time constraints for the implementation of projects may make certain mitigation options less viable than others. Efforts have been made in the preparation of this document to allow for flexibility in the development of mitigation plans so that the maximum environmental benefit can be obtained through the mitigation process.

The weighting factors for assessing stream impacts and mitigation projects have been adjusted to encourage avoidance or minimization of impacts and the design of high quality mitigation projects through the scoring process. Through the use of appropriate, well designed stream mitigation projects, the overall impact to water quality from unavoidable impacts can be lessened dramatically.

1.1. What is a Stream?

This document covers the evaluation of impacts to “streams” and associated proposals for compensatory mitigation authorized under Sections 404 and 401 of the Clean Water Act and the water quality certification rules found in OAC Chapter 3745-1. As will be discussed in further detail below, there are other watercourses that do not meet the definition of “streams” but nevertheless are jurisdictional waters of the United States and as such are under the jurisdiction of the Corps of Engineers and the State of Ohio for permitting purposes. While the focus of this document is on streams, nothing herein should be construed to suggest that mitigation for non-stream jurisdictional waters is not required in the context of the 404/401 process.

1.1.1. Important Definitions:

Proper understanding of several definitions is crucial for the correct interpretation and use of this document, since the protocols described in this document apply only to impacts to streams. For purposes of this document, a stream is defined as follows:

> **Stream:** a surface watercourse having a **channel** (as defined in ORC 6105.01) with a well defined bed and **bank**, either natural or artificial, which confines and conducts continuous or periodical flowing water.

The following are definitions for terms used in the definition for "stream" and are listed for clarification purposes:

> **Bank:** the land area bordering the stream channel equivalent to the width delimited by the **ordinary high water mark**.
>
> **Channel:** the area between definite banks of a natural or artificial watercourse which confine and conduct continuously or periodically flowing water (ORC 6105.01).
>
> **Ordinary High Water Mark:** that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas [33 CFR 328.3 (e)].

A glossary of additional definitions for common terms used within this document can be found in Appendix D.

1.1.2. Watercourses which are not streams:

It is recognized that there are some types of watercourses which either do not meet the definition of a stream or which by their nature do not possess features meriting protection under compensatory mitigation requirements. Specific examples are roadside ditches and agricultural grass waterways. Typically, these types of waterways are highly modified and maintained water conveyances which do not serve as habitat for aquatic life. Care should be taken to ensure that the watercourse in question has been thoroughly described and evaluated against the definition of a stream as well as the aquatic life use designations found in OAC Rule 3745-1-07 prior to determining that compensatory mitigation under this methodology is appropriate.

In some situations, it may be possible that the Corps of Engineers will determine that an individual Section 404 Permit and Section 401 Water Quality Certification from the Ohio EPA is required for the placement of fill or dredge material into watercourses which do not meet the definition of a stream as described in this document. These cases will be dealt with on a case-by-case basis. It is essential that measures are taken in all circumstances to protect downstream water quality and aquatic life uses.

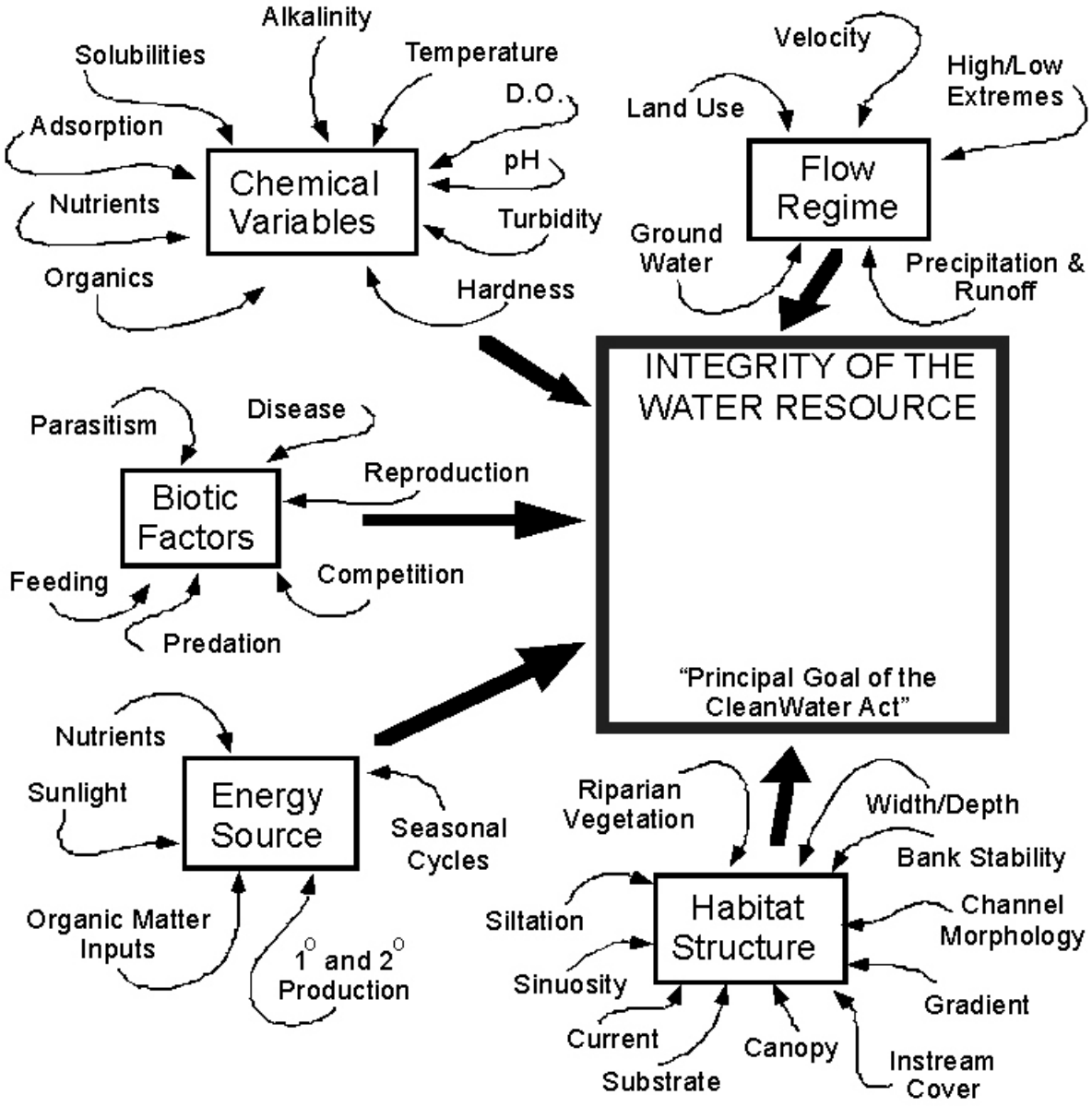
2.0 PROTECTING WATER RESOURCE INTEGRITY: OHIO WATER QUALITY STANDARDS

Water resource integrity is a concept that relates to the ability of a stream to support all of its designated uses and thereby meet the goals of the Clean Water Act and state law. Many factors influence the integrity of stream ecosystems (Figure 1, after Karr et al., 1986). Chemical water quality, habitat quality, stream hydrology, stream channel characteristics, and biotic factors all interact to determine the structure, resilience, and total biomass found within a biological community. Ohio EPA has long recognized that the quality of the biological community present within a stream is the best indicator of overall water quality and the aquatic life attainment status of a stream (Ohio EPA, 1988a; Ohio EPA, 1995).

The Ohio Water Quality Standards (WQS; Ohio Administrative Code Chapter 3745-1) consist of designated uses and water quality criteria that protect those designated uses (see Section 303 of the Clean Water Act). Use designations consist of two broad groups, aquatic life and non-aquatic life uses. The Ohio EPA has developed *biological criteria* (OAC Chapter 3745-1 -07, Table 7-14) to work in concert with *chemical criteria* to identify and protect various aquatic life designated uses of water bodies in the state. In applications of the Ohio WQS to the management of water resource issues in Ohio's streams, the aquatic life use criteria frequently result in the most stringent protection and restoration requirements, hence their emphasis in Ohio EPA regulatory approaches with respect to water resource integrity. Also, an emphasis on protecting for aquatic life generally results in water quality suitable for all uses.

Biological criteria rely upon the assessment of fish and benthic macroinvertebrate communities and comparison via indices to least-impacted ecoregional reference sites. These indices have been tailored to various stream sizes in each ecoregion in Ohio, including headwater streams with drainage areas less than 20 mi^2 (5,180 ha). Indices used to evaluate fish communities include the Index of Biotic Integrity (IBI), which has three different calculation procedures depending upon the size of the watershed and the type of equipment used to capture the fish, and the Modified Index of Well Being (MIwb) which is used only for sites with drainage areas > 20 mi^2. The Invertebrate Community Index (ICI) is used to evaluate the benthic macroinvertebrate community (Ohio EPA, 1989b).

Figure 1. Factors controlling resource integrity in streams. After Karr et al. (1986).



Aquatic ecosystems have a certain degree of resistance and resilience to stressors, such as the physical altering of stream channels through the placement of fill and dredge material, the altering of riparian areas (the area bordering the stream), changes in stream hydrology, and the acceleration of sediment loadings to the stream. However, a point can be reached where the ability of the stream ecosystem to tolerate these disturbances is exceeded. At this point, the biological community can go through profound changes in structural integrity (i.e. species composition, richness and biomass) often resulting in non-attainment of the applicable biocriteria.

Similarly, the geomorphology of the stream channel and its relationship to the surrounding watershed can be influenced by modifications caused by land use practices or direct disturbances to the stream channel. Perturbations such as channel straightening can be profound enough to cause drastic changes in the erosional and depositional processes in streams, often resulting in the down cutting of the channel, bank slumping, and high rates of sediment loading to the stream. The result of these changes often is also manifested in adverse changes within the stream biota. Impoundment of streams through damming or pond construction not only creates barriers to the migration of fish and other aquatic life, but can also change the pattern of bedload transport of stream sediment materials. These impacts are often not localized to the area directly perturbed, but also can cause changes in the stream channel downstream as the stream goes through a "channel evolution" process whereby a new equilibrium state in channel form and gradient is reached (Rosgen, 1996). This process often results in altered stream water chemistry, changes in habitat quality, flooding regime, and changes in peak flows and water velocities in the channel. If the impacts to the stream channel are great enough, the cumulative effect may result in non-attainment of Clean Water Act Goals for the stream.

In the context of State 401 Water Quality Certifications, the Director of the Ohio EPA must examine the potential impacts of a proposed project and make a determination that any lowering of water quality will not result in a violation of the water quality criteria or the impairment of existing uses. The anti-degradation requirements found in OAC 3745-1-05 ©)(1) states:

> "Existing instream water uses, as defined in rule 3745-1-07 of the Administrative Code, shall be maintained and protected. There may be no degradation of water quality that results in a violation of the applicable water quality criteria for the designated uses, or the elimination or substantial impairment of existing instream water uses."

Generally, proposed projects with impacts less than this threshold can be considered. The applicant must demonstrate that the impacts to the water resource cannot be avoided, that the impacts have been minimized to the greatest extent possible, and that

there are important social or economic justifications for the impact. These provisions are set forth under the antidegradation requirements found in OAC Chapter 3745-1. Further information regarding this process can be found in publications available from the Ohio EPA Division of Surface Water, Lazarus Government Center Office, P.O. Box. 1049, Columbus, Ohio, 43216-1049 or at the following internet address: http://www.epa.state.oh.us/dsw/rules/antidegguide_2003.html .

2.1 Aquatic Life Uses

The criteria for assigning aquatic life use designations are detailed in OAC 3745-1-07 (B). The six different aquatic life uses currently defined in the Ohio WQS are described as follows:

1) *Warmwater Habitat (WWH)* - this use designation defines the "typical" warmwater assemblage of aquatic organisms for Ohio streams; this use represents the principal restoration target for the majority of water resource management efforts in Ohio.

2) *Exceptional Warmwater Habitat (EWH)* - this use designation is reserved for waters which support "unusual and exceptional" assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those which are highly intolerant and/or rare, threatened, endangered, or special status (i.e., declining species); this designation represents a protection goal for water resource management efforts dealing with Ohio's best water resources.

3) *Coldwater Habitat (CWH)* - this use is intended for waters which support assemblages of cold water organisms and/or those which are stocked with salmonids with the intent of providing a put-and-take fishery on a year round basis which is further sanctioned by the Ohio DNR, Division of Wildlife; this use should not be confused with the *Seasonal Salmonid Habitat (SSH)* use which applies to the Lake Erie tributaries which support periodic "runs" of salmonids during the spring, summer, and/or fall.

4) *Modified Warmwater Habitat (MWH)* - this use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydromodifications such that the biocriteria for the WWH use are not attainable and where the activities have been sanctioned and permitted by state or federal law; the representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor quality habitat.

5) *Limited Warmwater Habitat (LWH)* - these are waters that were temporarily designated in the 1978 water quality standards because they did not meet specific warmwater habitat criteria. Criteria for the designation of these waters is the same as the criteria for the support of the warmwater habitat use designation. However, individual criteria are varied on a case-by-case basis which supercede the warmwater habitat criteria. These variations are specified within OAC Chapter 3745-1, and apply only to specific criteria at specified times and/or under specified flow conditions. No additional water bodies will be listed under this use designation in the future.

6) *Limited Resource Water (LRW)* - this designation applies to water courses which have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported; such waterways generally include streams in extensively urbanized areas, those which lie in watersheds with extensive drainage modifications, those which completely lack water on a recurring annual basis (*i.e.,* true ephemeral streams), or other irretrievably altered waterways.

Chemical, physical, and/or biological criteria are generally assigned to each use designation in accordance with the broad goals defined by each. As such the system of use designations employed in the Ohio WQS constitutes a "tiered" approach in that varying and graduated levels of protection are provided by each. This hierarchy is especially apparent for parameters such as dissolved oxygen, ammonia-nitrogen, temperature, and the biological criteria. For other parameters such as heavy metals, the technology to construct an equally graduated set of criteria has been lacking, thus the same water quality criteria may apply to two or three different use designations.

Ohio EPA applies aquatic life use designations to monitored stream segments after conducting a use attainability analysis. The specified methodologies for this analysis are described in the following documents available from the Ohio EPA:

1. Biological Criteria for the Protection of Aquatic Life, Volume I: The Role of Biological Data in Water Quality Assessment (02/15/88) [Ohio EPA, 1988a]

2. Biological Criteria for the Protection of Aquatic Life, Volume II: User's Manual for Biological Field Assessment of Ohio Surface Waters (01/01/88) [Ohio EPA, 1988b]

3. Biological Criteria for the Protection of Aquatic Life, Volume III: Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (09/30/89) [Ohio EPA,1989]

4. The Qualitative Habitat Evaluation Index [QHEI]: Rationale, Methods, and Application (11/06/89) [Rankin,1989]

2.1.1 Designated Aquatic Life Uses:

For the majority of larger creeks and rivers in the State of Ohio, aquatic life use designations for streams are specifically listed in OAC Chapter 3745-1. Based upon data presented in the Year 2000 Ohio Water Resource Inventory (Ohio EPA, 2000), there are 24,172.4 miles of streams listed in the State Water Quality Standards (OAC Chapter 3745-1). Table 1 provides details with respect to the number of stream miles falling under each use designation as of the year 2000. It is important to recognize that aquatic life use designations relate not only to the state of the stream ecosystem at the time that it is assessed, but it also relates to the potential for a stream to support a given aquatic life use. Therefore, it is possible that a stream segment being assessed has the potential to support an aquatic life use but is not in attainment of the Water Quality Criteria because of problems related to pollution. A condition of non-attainment of the appropriate criteria cannot be used as a justification to further impact the stream under the 404/401 permit review process since the goals of the Clean Water Act and state law are to restore these streams to full attainment.

Table 1. Summary of classified aquatic life uses for Ohio Streams as designated in OAC Chapter 3745-1 (from Table 2-1 in Ohio EPA, 2000).

Use Designation	Stream Miles
Exceptional Warmwater Habitat	3,053.6
Warmwater Habitat	18,610.4
Coldwater Habitat	424.3
Seasonal Salmonid Habitat	103.0
Modified Warmwater Habitat	889.9
Limited Warmwater Habitat	493.0
Limited Resource Water	599.1

2.1.2 Streams With no Designated Aquatic Life Use:

Many projects which fall under the Section 401 Water Quality Certification process impact small headwater streams which do not have aquatic life use designations specifically listed in OAC Chapter 3745-1. Although it is not currently known exactly how many stream miles in the state fall into this category, it is estimated that there are up to 37,360 miles of small streams which have not yet been assigned an aquatic life use by the Ohio EPA (Ohio EPA, 2000, Table 2-1). Estimates for the number of stream miles which currently have no assigned use designations increases significantly when streams with watershed areas less than 1.0 mi^2 are considered. Consideration of these small headwater streams in a regulatory context is important because these streams represent a significant proportion of the habitat for aquatic life within the state and also because these are the types of ecosystems which are most likely to be impacted by human activities.

For streams with watershed areas greater than 1.0 mi^2, or smaller streams which have pool depths generally greater than 40 cm, a use attainability analysis using the methodologies outlined in Section 2.1 can be conducted to determine the appropriate aquatic life use designation. However, in the majority of streams with watershed areas <1.0 mi^2, current use attainability analysis techniques utilized by the Ohio EPA may not be applicable since the flow hydrology and/or other physical features such as lack of deep pools limits the stream's ability to support well balanced resident fish communities. In addition, hydraulic conditions in these headwater streams also often fall outside those required under Ohio EPA's benthic macro-invertebrate sampling protocols for placement of artificial substrates, which require flowing water at least 30 cm in depth with current velocity of 0.3 fps (0.09 mps) or greater. Therefore, assessment of these small streams using currently available methodologies for conducting use attainability studies may be inconclusive or inaccurate in many situations. Attempts to apply use attainability data to these small headwater streams often result in mis-classification which can cause significant delays in the application review process.

Since 1999, the Ohio EPA has been conducting research to support the development of aquatic life use designations for "Primary Headwater Habitat" (PHWH) streams. These streams are defined as those having watershed areas generally less than 1.0 mi^2 and maximum pool depths less than 40 cm. Although fish communities necessary to attain WWH or other existing use designations may not be present in PHWH streams, these streams do support native vertebrate and macroinvertebrate fauna which are well adapted to headwater stream conditions (Ohio EPA, 2002a, Ohio EPA 2002b). In order to protect existing stream uses throughout the state, it is important to recognize the unique nature of PHWH streams and to take their ecological and water quality function into consideration when impacts to these ecosystems are proposed. Methodologies for

the evaluation of PHWH streams have been developed (Ohio EPA, 2002c) which can provide the basis for the decision making process regarding 401 Water Quality Certification applications. Although the PHWH use designations have not been promulgated into rule as of yet, applicants should utilize these evaluation methodologies where appropriate in order to better facilitate the review process. Information regarding the PHWH initiative can be found at the following web address: http://www.epa.state.oh.us/dsw/wqs/headwaters/index.html

The PHWH initiative has identified three classes of headwater stream in Ohio:

1) *Class III* PHWH streams are those lotic ecosystems that have the potential to support high quality cool and cold water vertebrate and benthic macro-invertebrate aquatic communities. These streams have diverse habitat, and are often spring fed with perennial water flow. The vertebrate predator functional group is represented by either cold water adapted headwater fish populations and/or cool or cold water adapted amphibians. Stream salamanders, mostly from the lungless family Plethodontidae, often replace fish as the dominant vertebrate predator functional group in these small lotic ecosystems.

2) *Class II* PHWH streams provide an environment which can support warm water adapted aquatic benthic macro-invertebrate community. These streams often also support warm water adapted populations of fish or amphibians. However, either as the result of intermittent flow conditions or physical limitations (substrate, gradient, lack of deep pools etc.), these streams will not support communities of organisms which will meet established biocriteria for warmwater habitat streams, even in a natural state.

3) *Class I* PHWH streams are ephemeral headwater streams which do not provide a significant aquatic life function, but which do have important water quality functions. These streams may sometimes meet the definition of Limited Resource Waters (LRW) or may be given their own classification under the PHWH hierarchy. These streams have little or no potential to support well balanced biological aquatic communities because of natural background conditions (i.e. lack of seasonal flow), or irretrievable human-induced conditions (i.e., regular flood control channel modification, dredging).

2.2 Non-Aquatic Life Uses

Non-aquatic life uses specified in OAC Chapter 3745-1 consist of recreational uses, water supply uses and human health concerns. Protection of these uses is important in meeting goals of the Clean Water Act and provides a direct linkage between the citizens of the state and the quality of stream environmental resources. Therefore,

proposals to impact non-aquatic life uses should be reviewed with an eye upon these issues to ensure that mitigative activities properly account for these impacts. Weighting factor evaluation processes described later in this document attempt to include these issues within the scaling system in order to protect these important stream functions.

2.2.1 Recreational Uses

The recreation uses defined in the Water Quality Standards are Bathing Waters, Primary Contact Recreation, and Secondary Contact Recreation [OAC Rule 3745-1-07 (B)(4)]. Bathing Waters consist of waters which are suitable for swimming where a lifeguard is posted or bathhouse facilities are present. The recreation uses most applicable to streams are the Primary Contact Recreation and Secondary Contact Recreation uses. The criterion for designating the Primary Contact Recreation use is ability of the water body to support full body contact recreation such as canoeing and swimming. If a water body is too small and shallow to support full body contact recreation, but partial body contact is likely through wading, etc. then the Secondary Contact use designation applies. The attainment status for Primary Contact and Secondary Contact waters is determined using bacteriological indicators (e.g., fecal coliform bacteria and *E. coli*). The standards for each criterion is specified in OAC Rule 3745-1-07, Table 7-14.

2.2.2 Water Supply Uses

Water supply uses include Public Water Supply, Agricultural Water Supply, and Industrial Water Supply. Public Water Supplies are defined as stream segments located within 500 yards of a potable water supply or the intake for food processing facilities. The Agricultural Water Supply and Industrial Water Supply use designations generally apply to all waters unless it can be clearly shown that such uses are not applicable. An example of this would be an urban area where livestock watering or pasturing does not take place and where the Agricultural Water Supply use would not be appropriate. Chemical criteria are specified in the Ohio Water Quality Standards for each use and attainment status is based primarily upon chemical-specific indicators.

2.2.3 Human Health Considerations

In addition to the bacteriological and chemical criteria established in the Water Quality Standards for the protection of recreational and water supply uses, other chemical and bacteriological criteria are also established within the Water Quality Standards for the protection of human health through dermal contact and other exposure scenarios. The Ohio EPA, in conjunction with the Ohio Department of Natural Resources (ODNR), also collects sediment chemistry and fish tissue data for evaluation to determine if contact or consumption advisories for specific water bodies are appropriate. Final contact and

consumption advisories developed based upon a joint effort of the Ohio EPA, ODNR, and the Ohio Department of Health. Information regarding current advisories can be accessed at the following world-wide web location:
http://www.epa.state.oh.us/dsw/fishadvisory/index.html

Although the great majority of the State Water Quality Certification applications proposing impacts or mitigation projects will not involve situations where human health risks are an issue, such instances are possible. Given the widely varying nature of scenarios where human health risks exist, it will be difficult to set standard review criteria and mitigation credit allocation guidelines that will fit all cases. Such reviews should be conducted on a case-by-case basis consistent with the concepts proposed herein as well as site-specific information critical for the development of environmentally protective practices.

2.3 Antidegradation Categories

Antidegradation refers to provisions that must be followed before any activity can be authorized on a water body that may result in a lowering of water quality including an increase in the discharge of a regulated pollutant, or activities that may significantly alter the physical habitat. The antidegradation provisions are required by the Clean Water Act and federal regulations, and along with water quality criteria and beneficial use designations, provides the overall structure of the state's water quality standards program. The antidegradation rule protects the existing uses of the water body, and only allows a lowering of water quality when it is necessary to support important social and economic development.

Ohio has two rules within its water quality standards to meet the antidegradation requirements. OAC Rule 3745-1-05 outlines the overall requirements for regulated activities on all waters while OAC Rule 3745-1-54 outlines additional provisions to be implemented when evaluating projects relating to impacts to wetlands. The rules establish procedures and requirements to ensure that the concepts incorporated in federal law and regulations are met. OAC Rule 3745-1-54 is currently in the process of revision to provide a single rule applicable to Section 401 water quality certification reviews for wetlands, streams, and lakes. This document is a critical component of this rule revision process.

One of the components of the antidegration rule and the review procedures that it establishes is the categorization and identification of water bodies based upon their social and ecological importance. The rule establishes varying levels of public participation opportunities, intergovernmental review, analysis of social and economic development considerations, and alternatives analysis dependent upon the quality of the water body in question in order to provide greater protection for exceptional quality

streams. Two broad categories of water bodies exist within this outline, *Limited Quality Waters* and *High Quality Waters*. With respect to streams, Limited Quality Waters include streams which are specifically designated in OAC Chapter 3745-1 as LRW, nuisance prevention, LWH, or MWH [OAC 3745-1-05 (A)(12)]. High Quality Waters simply includes all waters which are not Limited Quality Waters. However, under the High Quality Waters category, the following sub-categories are designated for streams:

1) *General High Quality Waters*: all water bodies not designated limited quality waters, Superior High Quality Waters, Outstanding State Waters, and Outstanding National Resource Waters.

2) *Superior High Quality Waters*: water bodies which have been assessed and determined to have exceptional ecological values based upon criteria established in the rule.

3) *Outstanding State Resource Waters*: water bodies with special significance for the state because of their exceptional ecological and/or recreational values under procedures established in the rule.

4) *Outstanding National Resource Waters*: water bodies which possess a national ecological or recreational significance as determined in accordance with the rule.

This document has incorporated an approach for the analysis of overall impact to stream ecosystems which includes weighting of impact debits and mitigation credits dependent upon the antidegradation categorization of the stream segments in question. For more information regarding the antidegration rule, the reader is referred to the Ohio EPA website (http://www.epa.state.oh.us/dsw/rules/antidegguide_2003.html) and to the rules in the Ohio Administrative Code.

3.0 STATE WATER QUALITY CERTIFICATIONS (CLEAN WATER ACT, SECTION 401)

According to the federal Clean Water Act, anyone (including private citizens, federal, state and local government agencies) who wishes to discharge dredged or fill material into the waters of the U.S., regardless of whether on private or public property, must obtain a Section 404 permit from the Corps of Engineers and a Section 401 Water Quality Certification from the state. In the State of Ohio, the Ohio Environmental Protection Agency administers the Section 401 Certification program.

Examples of activities that may require a Section 404 permit and a Section 401 Water Quality Certification for impacts to streams can include, but is not limited to: construction of boat ramps, placement of rigid structures for erosion protection, placing

fill, grading, dredging, ditching, construction of dams or dikes, stream channelization, stream straightening, installation of utility or road crossings, and the installation of road crossings and culverts.

Ohio EPA has pre-granted Section 401 Water Quality Certifications to 404 permits for certain types of projects that are similar in nature and cause minimal degradation to waters of the state. These permits are called Nationwide Permits and substantially expedite the permitting process. To determine if a particular project qualifies for Nationwide Permits coverage, or requires an individual Section 401 Water Quality Certification from Ohio EPA, applicants should contact the Corps of Engineers first to discuss the project, and to become familiarized with all of the regulatory requirements applicable prior to the commencement of any activities. Contact information for the Corps of Engineers District Offices with jurisdiction in Ohio are as follows:

Buffalo District (Lake Erie Basin):

1776 Niagra St.
Buffalo, NY 14207-3199
(716) 879-4330

Louisville District (Little and Great Miami River basins):

CEORL-OR-F
P.O. Box 59
Louisville, KY 40201-0059
(502) 582-5607

Huntington District (Muskingum, Hocking, and Scioto River basins):

502 8th St.
Attn: CEORH-OR-F
Huntington, WV 25701-2070
(304) 529-5210

Pittsburgh District (Mahoning River Basin):

William S. Moorehead Federal Bldg.
1000 Liberty Ave.
Pittsburgh, PA 15222-4186
(412) 395-7152

Information regarding Ohio EPA's requirements and processing guidelines for Section 401 Water Quality Certification applications may be found at the following web address: http://www.epa.state.oh.us/dsw/401/401.html , or by contacting the Ohio EPA Division of Surface Water, P.O. Box 1049, Columbus, Ohio 43216-1049. Since application guidelines and processing procedures may change over time, it is important to contact

the Ohio EPA prior to submitting an application in order to ensure that current procedures are being followed.

To minimize delays and objections during the permit and Water Quality Certification review process, applicants are encouraged to seek the advice of resource and regulatory agencies during the planning and design of mitigation plans. For restoration or stream relocation proposals and other complex mitigation projects, such consultation may improve the likelihood of mitigation success and reduce permit processing time. Furthermore, applicants should typically seek advice from consultants on complicated mitigation projects.

4.0 COMPENSATORY MITIGATION

The development of compensatory mitigation plans for projects which qualify for approval under the Section 401 State Water Quality Certification program is a critical part of the application process. Mitigation projects are required in order to ensure that there is no net loss of function with respect to existing stream uses, water quality functions of the stream and overall integrity of the aquatic resource. In the past, the Ohio EPA has typically required that mitigation be conducted at a ratio ranging from 1.5:1 to 3:1 of mitigation:impact on a linear foot basis. The implementation of stream mitigation procedures under this historical approach has been extremely challenging in that projects vary widely with respect to types of impacts and severity, and there is an inherent difficulty in matching proposed impacts to proposed mitigation on a foot by foot basis. For example, proposed projects for mitigation may affect a stream in a different watershed or a stream with a different aquatic life use designation than the stream segment where the impact will occur. To address this situation, this proposal employs a uniform methodology for weighting impacts and comparing these impacts to the proposed mitigation plan to ensure that no net loss of stream uses or functions occurs through the Section 401 Water Quality Certification process.

The Corps of Engineers has published a Regulatory Guidance letter (USACE, 2002) that provides the general guidelines under which Corps of Engineers districts must evaluate mitigation proposals. The Regulatory Guidance Document, as well as draft mitigation and monitoring guidelines developed by each of the Corps of Engineers districts with jurisdiction in Ohio (USACE, 2003a; USACE, 2003b; USACE, 2003c; USACE, 2004), should be consulted when developing stream mitigation plans. This document has been developed to conform as closely as possible with the Regulatory guidance document and the draft Corps of Engineers district guidelines. However, applicants are encouraged to consult with both the Ohio EPA and the appropriate Corps of Engineers district office when developing stream mitigation plans to ensure that the plan is consistent with all existing guidance and requirements.

4.1 Goals for Compensatory Mitigation

Compensatory mitigation projects must be designed to compensate for the loss of ecological and water quality functions as a result of adverse impacts to streams. These impacts can be caused by channelization, channel filling or alteration of the morphological characteristics of a stream channel or stream bank in such a manner that the habitat quality, morphologic stability, or ability of a stream to support its designated uses is negatively impacted or impaired.

General goals for stream mitigation projects under this proposal are outlined below:

- Whenever possible, on-site relocation or restoration of stream segments impacted by the activities for which a State 401 Water Quality Certification is sought is a priority. Stream relocation projects should be designed to restore and preserve stream segments to provide high quality habitat for aquatic life, allow for the natural migration of aquatic species, and provide channel morphology appropriate to the watershed type and setting as determined through comparisons to reference stream reaches (see for example Rosgen, 1996; Newberry and Gaboury, 1994). Highest credit should be given for projects which result in a naturally dynamic morphologically stable stream channel that have a high probability of reaching the stream's highest potential with respect to habitat for aquatic life and geomorphic stability without the need for long-term maintenance.

- Restoration of impaired stream segments to provide for no net loss of stream function as the result of the implementation of authorized impacts is a priority. Stream restoration projects should be designed to restore and preserve stream segments to provide high quality habitat for aquatic life, allow for the natural migration of aquatic species, and provide channel morphology appropriate to the watershed type and setting as determined through comparisons to reference stream reaches (see for example Rosgen, 1996; Newberry and Gaboury, 1994). Highest credit will be given for projects which result in a naturally dynamic morphologically stable stream channel that have a high probability of reaching the stream's highest potential with respect to habitat for aquatic life and/or geomorphic stability without the need for long-term maintenance.

- Stream preservation projects used for compensatory mitigation should focus upon stream corridors which provide the greatest benefits with respect to the protection of aquatic life, water quality, and other designated uses. The allocation of mitigation credits for stream preservation projects will vary depending upon a number of factors such as the presence of endangered,

threatened or declining aquatic species, and the protection of water quality in threatened watersheds. This guideline is used in order to ensure that there is no net loss of stream function as the result of the implementation of authorized impacts under a State 401 Water Quality Certification. In most cases, the number of mitigation credits from stream preservation used to compensate for impacts should be limited to 70 percent of the necessary total.

- Stream reaches used as compensatory mitigation sites should be provided with sufficient forested riparian areas[1] to allow for the long-term integrity of the stream corridor. Enhancement or enlargement of forested riparian corridor should be encouraged in instances where past impacts have removed or seriously degraded the condition of woody vegetation in this zone. Allocation of mitigation credits varies depending upon the width of the forested riparian buffer provided for in the mitigation plan.

- In conjunction with the establishment or preservation of forested riparian buffer areas adjacent to mitigation stream segments, re-connection or preservation of active floodplain areas adjacent to the stream is a priority. These areas serve a vital function in the long term stability of the stream channel and the protection of downstream uses. Allocation of mitigation credits varies depending upon the acreage of active floodplain provided for in the mitigation plan. The design of such projects should take into account the potential impacts of flooding upon public safety and real property prior to incorporation into stream mitigation plans.

- Mitigation projects compensating for permanent or long-term impacts to stream ecosystems must provide protection in perpetuity for all mitigation areas in accordance with requirements described in this document. Mitigation projects for temporary impacts may be of limited duration if it can be demonstrated that the impacted area will be completely restored and will recover quickly and that the mitigation project will provide significant water quality benefits during implementation.

- Compensatory mitigation plans must provide measurable success criteria which can be used to gage the effectiveness of the mitigation efforts. With respect to stream restoration projects, these criteria must be selected to meet the following hierarchical objectives: 1) to create vertical channel stability; 2) to provide

[1]The great majority of streams in Ohio would naturally have associated forested floodplains. However, it is recognized that many stream segments also have different vegetation patterns within the stream corridor (e.g. forested, open water or emergent wetlands, prairie areas, etc.). In these circumstances, applicants are required to provide or preserve adequately vegetated riparian buffer areas made up of native flora in conjunction with the mitigation activities.

appropriate floodplain elevation, extent and quality; 3) to provide appropriate channel dimension, bed form and pattern; and 4) to provide appropriate in-stream and riparian habitat. Monitoring plans should provide for the acquisition of quality physical, biological and chemical data, as appropriate, which can be used for comparison to the success criteria. In addition, mitigation plans should include contingency plans, if necessary, to remedy any problems identified regarding the success of the mitigation activities.

- It is strongly encouraged that applicants choose locations for compensatory mitigation for stream impacts as close as possible to the location of the proposed impact. This is important so that the loss of the beneficial functions provided by the stream channel being impacted can be minimized within the watershed in question. The allocation of mitigation credits will vary dependent upon the location of the compensatory mitigation in relation to the location of the proposed impact.

- Off-site mitigation projects should be focused upon stream segments of the same general watershed size as the stream which is being impacted whenever possible. This not only allows for more logical translation of impact to mitigation with respect to channel length comparisons, but also avoids imbalances of impacts and mitigation between stream size categories based solely upon economic considerations. Weighting factors for the allocation of mitigation credits vary dependent upon the location of the compensatory mitigation with respect to the watershed size in relation to the location of the proposed impact.

- Where possible, supplemental water quality improvement projects that can be implemented in conjunction with compensatory mitigation projects are encouraged. Additional mitigation credits are allocated for projects that include the simultaneous implementation of supplemental water quality improvement projects.

- Whenever possible, the implementation of compensatory mitigation projects should occur prior to or at the same time that the impacts authorized under the Section 401 Water Quality Certification are occurring. Projects in which the implementation of mitigation occurs after the impacts have occurred are discouraged and will receive less mitigation credit.

4.2 Compensatory Mitigation Categories

Compensatory mitigation categories include post-construction best management practices (BMP's) to protect downstream uses, stream restoration, stream preservation, stream relocation, and associated preservation, restoration and enhancement activities

which occur within the active floodplain and the forested riparian buffer zone adjacent to the stream.

4.2.1 Post-Construction Best Management Practices

Post-construction BMP's are those activities which are designed to protect downstream water quality and stream uses through the long term control of the quantity and quality of runoff from sites impacted by construction activities. The use of post-construction BMP's is required for all construction sites greater than one acre through the construction sites general NPDES permitting process promulgated under Ohio Revised Code Section 6111.035 and OAC Chapter 3745-38. All applications for Section 401 Water Quality Certification process must include detailed descriptions of measures which will be taken to protect existing uses for stream segments downstream of the proposed impact with respect to aquatic life, water quality, and channel stability. These requirements will often go above and beyond minimal requirements for compliance with general construction stormwater permitting requirements if deemed necessary to mitigate for lost stream functions and to protect downstream uses.

Applicants subject to the post-construction BMP requirements under the 401 Water Quality Certification program must demonstrate that measures have been properly installed and that they will be properly maintained over time through the identification of responsible parties and through the establishment of financial assurances as appropriate to ensure implementation. In cases where reasonable assurances cannot be provided that the efforts necessary to properly maintain these provisions, on or off-site stream restoration or preservation may be required to provide sufficient mitigation credits for the proposed impacts.

Guidance for procedures to be followed to provide appropriate downstream protection can be found in the most recent edition of the Ohio Department of Natural Resources Division of Soil and Water Conservation and Natural Resources Conservation Service *Rainwater and Land Development Manual.* In addition, information regarding requirements for the control of storm water from construction sites and post-construction BMP's can be found through the Ohio EPA web site:

http://www.epa.state.oh.us/dsw/storm/index.html

The U.S.EPA also maintains a web site providing a national menu of best management practices for storm water phase II requirements, located at:

http://cfpub.epa.gov/npdes/stormwater/menuofbmps/post.cfm

As explained in Section 5.2.1.3, for streams which are designated or found to meet the

definition of Limited Resource Waters, or to be truly ephemeral meeting the definition of Class I PHWH, the implementation of effective post-construction BMP's to protect downstream uses may be sufficient to fulfill all of the compensatory mitigation required under a Section 401 Water Quality Certification.

4.2.2 Stream Relocation

Stream relocation means to create a stream channel to convey the stream flows away from the natural or existing stream channel in order to facilitate development, alter hydrologic conditions or otherwise cause a permanent abandonment of the an existing stream channel from flowing water. In conducting a stream relocation, the existing aquatic habitat is completely eliminated through the transfer of flow or the placement of fill material into the existing channel. Stream relocation is therefore looked upon as a severe impact with respect to the existing use of a stream segment. However, if properly designed and implemented, a stream relocation project could be considered towards part of the stream mitigation requirements for the proposed impacts. Evaluation of stream relocation projects with respect to the number of mitigation credits allocated follows similar principles for evaluation of stream restoration projects as outlined in Section 4.2.3. In general, relocated stream segments would need to be protected from further impacts in perpetuity (Section 4.4), provide in-stream habitat or geomorphology in a way that fosters a return to stable morphologic conditions, enhances the potential of the stream to meet its designated or potential aquatic life, recreational and water supply uses, and provide sufficient forested riparian buffer and floodplain areas (Section 4.3) to promote long-term stream integrity. In some cases, it may be appropriate to include provisions within the legal documents established to protect the relocated stream segment to allow for future stream restoration efforts should the need or opportunity arise. Weighting factors for determining the number of credits allocated to stream relocation projects are adjusted depending upon the degree of conformance to these principles (see Section 5.2.7).

4.2.3 Stream Restoration

Stream restoration refers to activities conducted to permanently improve in-stream habitat or geomorphology in a way that fosters a return to stable morphologic conditions and enhances the potential of the stream to meet its designated or potential aquatic life, recreational and water supply uses. Properly applied stream restoration techniques will enhance the stream segment where active measures are implemented and positively influence downstream stream segments by restoring appropriate bedload transport of sediment and moderating channel forming flows. Stream restoration goals will include the conversion of an unstable, altered, or degraded stream channel toward its natural or referenced stable condition, considering recent and future watershed conditions. This process may include restoration of the stream's geomorphic dimension, pattern and

profile and/or biological and chemical integrity, including transport of water and sediment produced by the stream's watershed in order to achieve dynamic equilibrium.

Stream restoration outcomes can be equated to concepts relating to the channel evolution sequence described by Rosgen (1996) and Darby and Simon (1999) as illustrated in Table 2. Under optimum conditions, streams will be in their "natural" state, meaning that the stream channel geomorphology will be in a relative state of equilibrium with respect to erosional and depositional processes related to bed load. Although the stream may meander within its floodplain, the overall gradient, dimension and pattern of the stream channel will remain relatively constant over time. When natural or man-induced changes occur within the stream channel or the watershed, changes in the erosion or deposition rates of sediment or flow regimes may result, causing the stream channel to down cut, often causing areas of active floodplain to become disconnected from the stream channel. These processes often cascade and affect other stream reaches until the stream channel obtains a new equilibrium, resulting in a new stable channel dimension and pattern. The entire process may take many years to complete itself naturally, during which time the stream has experienced extremely high rates of sediment transport to downstream segments. In addition, the in-stream habitat for aquatic life is typically very unstable during this process, often resulting in poor ecosystem integrity.

Stream restoration projects proposed as compensatory mitigation should be reviewed to determine the degree of improvement that will be realized in the stream channel condition with respect to the concepts illustrated in Table 2. Although it may be impossible to achieve a fully naturalized stream condition after the five year permitting period associated with the Section 404/401 permitting process, it should be possible to implement efforts which will result in a geomorphically fit channel, thus setting the stage for full restoration of the channel to its highest potential. Methodologies for assessing and predicting stream channel stability are presented in Rosgen (2001), and analysis of existing conditions as well as predicted outcomes from stream restoration activities using these methodologies may be appropriate in the review of Section 401 applications. For purposes of scoring stream restoration activities according to this document (see Section 5.2.7), those which have a high probability of moving the condition of the stream channel two or more columns to the right in Table 2 should be considered to be "Excellent" restoration activities. Those that result in changes which will move the stream channel one column to the right (into the stabilization or naturalization category) should be considered to be "Good" restoration activities, while those designed to prevent degradation of the stream (movement to the left in Table 2) would be considered to be "Moderate" stream restoration activities.

Table 2. Restoration continuum for gaging the quality of stream restoration proposals. (Source: Dan Mecklenburg, ODNR-DSWC)

Restoration Continuum ➜				
Non-Mitigative Conditions		*Stabilization*	*Naturalization*	*Restoration*
Stream Habitat Eliminated	**Declining Stream Quality**	**Vertically Stable Stream Channel**	**Geomorphically Fit Channel**	**Highest Potential**
Enclosed (culverted, or tiled)	Stream channel down cutting, downstream segments often aggrading with high embeddedness of substrates.	Grade controls allowing stabilization of channel to highest potential channel type.	Same Channel Type as Highest Potential	"Natural" condition
Impoundment of stream	Stream early in the channel evolution sequence	Rosgen (1996) Type B Channel Type	Channel morphology consistent with flow regime	
		Stream Channel Entrenched	Channel geomorphology recovering to highest potential.	
			Late in the channel evolution sequence.	

An important aspect of the implementation of any stream restoration plan is the preservation or establishment of adequately vegetated riparian buffer and active floodplain areas adjacent to the stream. The best stream restoration plans will include the provision of adequate vegetated buffer within the floodplain to allow for the formation of stable channel features and the appropriate meander pattern within the stream corridor appropriate to the stream type based upon comparison to reference conditions. A matrix integrating mitigation credit allocation for riparian restoration as well as the acreage of active flood plain re-established in stream restoration projects is presented in Section 5.2.5, Table 3, which grades these efforts on a scale of "low" to "excellent".

Restored mitigation sites must be protected by a conservation easement or a restrictive covenant (Section 4.4). Proposals for restoration mitigation also must include an explanation regarding the values or functions that are being restored, the degree of restoration, and a narrative description of how the restoration will be accomplished.

4.2.4 Stream Preservation

Compensatory mitigation through stream preservation means the conservation, in its naturally occurring, enhanced, or present condition, of ecologically important stream corridors in perpetuity, to prevent their destruction, degradation, or alteration in any manner which is not consistent with the approved mitigation plan. Stream preservation projects would have to include the implementation of legal mechanisms approved by the Ohio EPA which are sufficient to prevent harm to the stream ecosystem (Section 4.4). Channel preservation alone will not be accepted without inclusion of the protection of an appropriate adjacent riparian buffer as necessary to ensure protection of the stream. There are three main goals of this type of compensatory mitigation: 1) to maximize the potential of a stream to reach its highest potential through the provision of adequate connection of the stream channel to its floodplain, 2) to protect suitable riparian buffer areas which will promote long term stability of the stream corridor, and 3) to protect optimal habitat for fish and other aquatic life.

Stream preservation projects should be focused upon preserving areas of high ecological significance and stream functional integrity. Some examples of these stream types are as follows:

- streams designated as or meeting the definition of Cold Water Habitat or Exceptional Warmwater Habitat in OAC Chapter 3745-1;
- streams designated as Superior High Quality Waters, Outstanding State Waters, or Outstanding National Resource Waters in accordance with OAC Rule 3745-1-05;

- streams designated as Scenic Rivers or Wild and Scenic Rivers under ORC Section 1517.14;

- streams documented to provide habitat for federal or state listed endangered or threatened species or species of special management concern;

- streams identified by the Ohio Department of Natural Resources Division of Wildlife in the document "Candidate Streams for Protection and Restoration" (ODNR, 2002) or the most recent revision thereof; and

- streams which meet the definition of Class III PHWH in accordance with Ohio EPA's Headwater Habitat Initiative.

Preservation projects are also encouraged for existing highly functioning stream segments in watersheds listed as impaired in either the State Water Quality Inventory generated in compliance with Section 305 (b) of the Clean Water Act or on the State List of Impaired Waterbodies generated in compliance with Section 303 (d) of the Clean Water Act. Where they exist, the preservation of these stream segments is important in order to prevent further degradation within the watershed and to provide the opportunity to restore these watersheds to meet Clean Water Act goals.

In order to promote the restoration of impaired waters in the State of Ohio, stream preservation projects proposed as compensatory mitigation ideally should account for no more than 70 percent of the total mitigation credits for any project where cumulative impacts exceed 500 linear feet of stream channel. This limitation is important to ensure that existing stream uses are protected and that there is no net loss of stream function through the implementation of the Section 401 Water Quality Certification process. The limitation does not apply in instances where mitigation is required for impacts to streams designated as Limited Resource Waters or meeting the definition of Class I PHWH. The Ohio EPA may waive this guideline in cases where it can be demonstrated that, despite the best efforts of the applicant, no appropriate stream restoration project exists which could apply towards the compensatory mitigation requirements for a specific project.

4.3 Riparian Buffer and Floodplains

The presence of appropriately vegetated riparian areas along stream corridors is important for the maintenance of stream resource integrity. These riparian areas provide flood storage which moderates flood volumes and duration, improve stream channel integrity and long term stability, act as sources of woody debris for fish habitat, are a source of leaf litter which provides an important energy resource for aquatic

organisms, act to buffer inputs of non-point source inputs of nutrients and sediment to the stream ecosystem, and serve an important function in the storage of sedimentary material within the stream corridor. These areas are also important economically through the storage of flood flows and the moderation of erosional processes which protects lands adjacent to stream corridors.

The riparian buffer component of stream mitigation plans should utilize only native Ohio vegetation for plantings in floodplains, stream banks, and within channels. A list of native Ohio species that thrive in these three habitats and are indicative of high quality reference streams is provided in Appendix D. Throughout most of Ohio, woody plants should dominate the flora within a forested riparian buffer. However, other floral community types may be suitable outcomes in historical prairie and wetland streams, especially along small stable streams identified as type E channels using the Rosgen (1996) classification system. Required monitoring plans would have to document ongoing stability of the vegetated buffer and allow for the natural succession of vegetation, while controlling the influx of non-native invasive species.

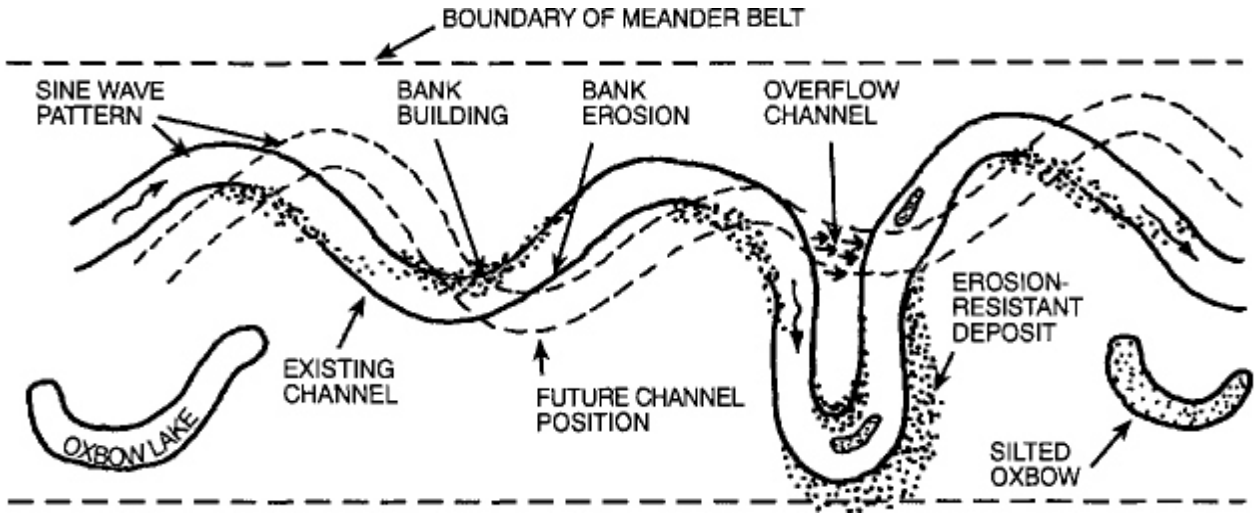
Although the Ohio EPA does not generally exercise direct regulatory authority over riparian areas adjacent to streams, consideration of the quality of existing riparian zone quality and associated effects upon stream integrity when impacts authorized under a Section 401 Water Quality Certification is critical in order to fully address impacts to water quality. In addition, provision for adequate riparian buffer zones in conjunction with the development of compensatory mitigation plans is crucial if there is to be a high probability of success for these projects.

In general, the minimum riparian buffer width acceptable in conjunction with stream preservation projects is 25 feet from either bank for streams with watershed areas less than 20 mi^2 and 50 feet from either bank for streams with larger watershed areas. Stream preservation mitigation proposals calling for less than these minimum buffer widths can be approved on a case by case basis if justification can be provided for the deviation, and the project is considered to be ecologically significant or otherwise important for maintaining water quality or the geomorphic stability of the stream channel. However, the amount of mitigation credit will be scored lower in these situations. In general, higher mitigation credits will be awarded for projects with higher degrees of protection for riparian corridors and active floodplain areas.

Maximum preservation credits are awarded for preservation of the entire streamway, which is defined as a belt of land which includes the meander belt width (Figure 2) and an additional width of vegetated riparian buffer equal to the minimum buffer width. The width of the streamway can be determined from site specific information or through the following empirical methodology (Ward et al., 2002):

Figure 2. Illustration of the meander belt width.

Source: ODNR Stream Management Guide No. 3: Natural Stream Processes, http://www.ohiodnr.com/water/pubs/fs_st/streamfs.htm



$$Width_{Streamway} = 120\ D.A.^{0.43} + B_{min}$$

where: $Width_{streamway}$ = the streamway width in feet;

D.A. = the drainage area upstream of the site in square miles; and

B_{min} = the minimum buffer width in feet
(25 ft for D.A. < 20 mi^2, 50 ft for D.A $\geq$ 20 mi^2)

Section 5.2.5 outlines in detail the methodologies used within this document to calculate debits with respect to impacts within riparian corridors associated with stream modifications as well as the awarding of mitigation credits in association with riparian establishment and protection in conjunction with stream mitigation plans. In the evaluation of the riparian corridor, it is important to consider both the presence and maturity of native vegetation and the presence of active floodplain. Many streams in Ohio are entrenched and are subsequently isolated from their floodplains. Re-connection of the stream channel to an active floodplain is a primary goal in the stream restoration process.

4.4 Legal Protection of Mitigation Areas:

In order for a mitigation area to qualify as compensatory mitigation for impacts to streams, legal instruments including deed restrictions, conservation easements, or fee simple ownership must be put in effect for the property in question. All stream restoration and preservation mitigation sites must to be protected in perpetuity through a fee simple title of deed or a conservation easement held by a non-profit conservation organization or government agency with natural resource or environmental responsibilities and functions. Exceptions may be made for approved limited term projects used to mitigate for temporary or minimal impacts to streams as discussed in Section 4.4.1 of this document.

Under current law, Ohio EPA cannot be the holder of a conservation easement. For projects where cumulative impacts to streams are less than 500 linear feet where it can be documented that no non-profit conservation organization or government agency with natural resource or environmental responsibilities and functions is willing to take on fee simple ownership or a conservation easement, the Ohio EPA may accept perpetual protection of a mitigation parcel through an appropriate deed restriction . Use of this mechanism to protect mitigation parcels would be subject to a case-by case review.

In addition to providing for the preservation in perpetuity of mitigation areas, documents used to protect mitigation parcels need to provide for management of the area in accordance with the conditions of the approved Section 401 State Water Quality Certification. Sample language for restrictive covenants and easements are available from the Ohio EPA Division of Surface Water, but these documents are often site specific in nature and thus will need to be modified to address each site. A copy of the most recent edition should be obtained prior to use. Covenants and easements will be reviewed for acceptability on a case-by-case basis. Covenants and easements must be duly recorded with the appropriate local entity. In the event that restricted areas are sold or conveyed to another entity, the restricted area must be clearly defined in appropriate documents utilized for that transaction.

4.4.1 Limited Term Mitigation Projects

Some projects which require a 401 Water Quality Certification may have only temporary impacts (less than 12 months) to streams. In cases where adequate site restoration plans are in place to ensure that long-term damage to stream integrity will not occur, the Ohio EPA may accept mitigation plans which do not provide protection of the mitigation site in perpetuity as long as the applicant can demonstrate that there will be a significant benefit with respect to water quality or stream resource integrity. These limited term mitigation projects may fall under the definition of any of the mitigation categories described in this document or may consist exclusively supplemental water

quality projects as described in Section 5.2.13. If supplemental water quality projects are used exclusively, the project should address known causes or sources of water quality impairment for the stream in question. The allocation of mitigation credits for limited term projects should follow the general guidelines described in this document, but should be scaled according to the duration proposed for the project using a ratio of the project duration to 70 years. Under no circumstances will projects or portions thereof which are funded through government pollution abatement programs be accepted for stream mitigation credit.

4.5 Maintenance:

Mitigation plans which require perpetual or long-term human intervention will usually not be acceptable. Mitigation areas should be designed to be naturally sustaining following the completion of a five year implementation and monitoring period. Hydrology must be adequately considered since plans requiring an energy subsidy (pumping, intensive management, etc.) will normally not be acceptable. The goal is to achieve a natural state which does not depend upon maintenance. It is understood that in restoring vegetated riparian buffer areas, some periodic maintenance such as mowing, invasive plant removal, or controlled burning may be necessary. However, plans requiring maintenance for periods of greater than five years duration will be discouraged.

5.0 USE OF WEIGHTING FACTORS TO EVALUATE COMPENSATORY MITIGATION PLANS

As discussed in Section 1.0 above, the traditional method used by the Ohio EPA for assessing impacts to streams and mitigation plans was to use ratios based solely upon linear measurements of stream channels. The inherent weaknesses of this approach are failures to recognize and account for the differences in stream resource integrity, aquatic life use potential, overall impacts on chemical and biological water quality, habitat quality, and potential overall impacts on downstream water quality which may exist between impacted and mitigated stream segments. The result has been that projects are reviewed using varying criteria dependent upon the circumstances present in each individual case with little unifying guidance. This has resulted in lengthy review times and lack of standardization which has impacted the quality and timeliness of the Water Quality Certification review process.

This chapter describes a procedure for the use of weighting factors in evaluating impacts and proposed compensatory mitigation projects for streams under the Section 401 Water Quality Certification process. This procedure has been developed in order to better account for the variability encountered between different types of impacts, stream quality, and the quality of mitigative approaches when comparing impacts to streams and the compensatory mitigation proposed to offset those impacts. The

procedure uses an additive model for scaling the severity of impacts using several factors related to stream integrity to arrive at an overall impact weighting factor. The final impact weighting factor is then multiplied by the length of stream channel affected by a proposed impact, resulting in a calculation of debits which must be offset through credits earned through compensatory mitigation activities. For projects where there will be impacts to more than one stream, or where impacts in geographically distinct stream segments will occur which differ in their scope or severity, each impacted segment is scored separately and the resulting stream impact debits are added to determine the total number of mitigation credits which will be required as compensatory mitigation.

The quality of proposed compensatory mitigation projects are similarly evaluated using additive weighting factors that are multiplied by the length of stream channel which will directly benefit from the mitigation activity, resulting in stream credit calculations. As with the stream impact assessment, where there are separate mitigation projects proposed for geographically distinct stream segments, each mitigation segment is scored separately and the resulting scores added to determine the total mitigation credits allocated to the proposal. To be approved, mitigation credits calculated through the process must equal or exceed the impact debits derived from the impact analysis. Although a rough correlation can be made between the sum of impact weighting factors and a "mitigation ratio," this approach would be misleading since the weighting factor approach for scoring mitigation projects can result in scores greater than or less than 1.0, depending upon the quality of the compensatory mitigation proposed.

Two forms (Form A and Form B) have been developed to facilitate the weighting factor analysis and stream impact debit and mitigation credit scoring process. Wherever possible, weighting factors selected for scoring impacts and mitigation projects were chosen based upon the availability of existing information in order to reduce the burden of data development during the application process. In cases where a stream has not been evaluated in the past, significant data gathering may be required prior to making an application to the Ohio EPA in order to complete the weighting factor analysis. All proposed projects must first be evaluated using the Adverse Impact Weighting Table (Form A) to determine the number of stream impact debits. Mitigation credits are then calculated using the Stream Mitigation Weighting Factors Table (Form B). An overview of the credit/debit procedure is provided in Section 5.1 and specific instructions for each of the weighting factors are provided in Section 5.2.

It is recognized that in some stream restoration scenarios, especially those in which dams and other rigid engineered structures are removed from streams, there is a probability that additional benefits can be realized upstream and downstream of the stream segment directly altered by the restoration activity. A table (Table C.1, Appendix C) has been devised to allow for the calculation of mitigation credits

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name:_____ Page_____ of _____

Stream Segment:_____Use Designation: _____

Impact Summary:_____

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use Section 5.2.1	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	
Existing Habitat Quality Section 5.2.2	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	
Priority Area Section 5.2.3			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		
Existing Geo-morphic Integrity Section 5.2.4			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	
Existing Flood Plain Quality Section 5.2.5.1			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	
Impact Category Section 5.2.6			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1. Sum of Impact Factors (I) =**	
Enter the proposed length of stream to be impacted into Box 2.	**Box 2. Length of Impact (D) =**	
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3. Total Stream Impact Debits (I x D) =**	

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name:_____ Page: ____ of _____

Stream Segment:_____ Use Designation:_____

Project Summary:_____

_____

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	
Box 2. Mitigation Length (D) =	
Box 3. Mitigation Credits (P x D) =	

associated with secondary and tertiary benefits for these types of projects. The procedures for conducting this analysis are described in Section Appendix C.

To further simplify the impact vs. mitigation review process, the weighting factor review process is not being proposed for use when streams designated under the LRW, MWH, and LWH aquatic life use designations, or found to meet these designations based upon an attainability analysis. Instead, alternative mitigation requirements for post-construction best management practices are used for LRW streams and a default impact weighting factor is used for MWH and LWH streams. These alternative requirements can also be used for undesignated streams determined to meet the definition of Class I and Class II PHWH in instances where the applicant elects to use the alternative attainability analyses provided under the PHWH protocols as outlined in Section 2.1.2. The alternative mitigation and weighting factor protocols for LRW, MWH, LWH, Class I PHWH, and Class II PHWH streams are described in Section 5.2.1.3.

5.1 Tabulating and Evaluating Impact Debits and Mitigation Credits

Instructions for the tabulation of impact debits associated with the Section 401 Water Quality Certification are provided in Form A. In summary, appropriate weighting factor scores for each of the weighting factor categories are summed and then multiplied by the linear feet of channel impacted by the project to determine the total number of debits for the impact. In situations where physically distinct stream segments will be impacted, or where there will be significantly different impacts to different portions of the same stream segment within the project site, separate analyses should be conducted using multiple copies of Form A, and the results added to determine the total number of mitigation credits required. Where default mitigation criteria apply for particular projects, or portions of a larger project, scoring should be conducted according to the procedures outlined in Form A and Section 5.2.1.3 of this document.

Tabulation of mitigation credits allocated for compensatory mitigation projects is conducted using Form B and, if applicable, Form C (Appendix C). Again, the instructions provided in Forms B and C should be followed in order to ensure accurate calculation of mitigation credits. For projects where multiple mitigation sites will be used to provide compensatory mitigation, each mitigation project site should be scored separately using multiple copies of Form B, and the results added to determine the total number of mitigation credits applicable for the project. If it is determined that the allocation of secondary or tertiary mitigative benefit credits is appropriate for any of the stream restoration components of the mitigation package, Form C should be completed and attached to the appropriate Form B for that component in accordance with the instructions provided in Appendix C.

To facilitate the completion of the impact and mitigation comparison, a Water Quality

Certification Summary Form is provided in Appendix D in which the credit determinations from the weighting forms can be summarized for comparison. Ohio EPA staff will review all of the completed tables and supporting documentation for completeness and accuracy prior to a determination regarding the final disposition of the application. As mentioned previously, thorough coordination of the application for a State Water Quality Certification and proposed compensatory stream mitigation projects with the Division of Surface Water 401 Unit prior to and during the development of stream mitigation plans is important to ensure that projects are properly designed and scored prior to the submission of an application to the Ohio EPA.

5.2 Weighting Factors:

The criteria for scoring each weighting factor listed in Form A and Form B are described below. Values were assigned to each weighting factor based upon several considerations relating to stream resource integrity in order to provide an integrated measure of the value of the resource being impacted, restored, or protected through the Section 401 Water Quality Certification process. These factors include the rarity and quality of the types of stream ecosystems represented by aquatic life use designations, measurements of habitat quality, biological and geomorphic integrity, and other factors which can be used to denote stream quality such as the presence of endangered, threatened or rare species, the quality of the floodplain and wooded riparian zone, etc. Scores for each weighting factor were adjusted so that under an "average case" scenario, the ratio of calculated impact credits using Form A would roughly equal 1.5 times the calculated mitigation credits using Form B for a similar set of conditions under stream restoration and relocation scenarios (see Section 5.3). This number was selected because a mitigation ratio of 1.5 : 1 has historically been used for most stream projects under the 401 review process. Mitigation ratios for preservation projects have historically been higher than those required for stream restoration, although there has been no set policy in this regard. In the development of this document, it has been recognized that stream preservation projects tend to be a much less expensive mitigation alternative which in many cases does not replace the resource being lost through the approval of a permit through the Section 404/Section 401 review process. Therefore, the target "mitigation ratio" for preservation activities has been designed to be higher than that granted for stream restoration activities, and some limits are proposed on the use of stream preservation as compensatory mitigation for larger scale projects (see Section 4.2.4).

The descriptions for each weighting factor described below include the identification of the average case condition used to adjust factor scoring, along with other pertinent information regarding the assignment of scoring values. "Average case" scoring results for Forms A and B is summarized in Section 5.3.

5.2.1 Aquatic Life Use Weighting Factor:

The aquatic life use designations of the impacted stream segment and the stream segments proposed for compensatory mitigation are used as the primary discriminating tools for the evaluation process outlined in this document. Water Quality Standards for both chemical constituents and in-stream biology for streams promulgated in OAC Chapter 3745-1 are based upon aquatic life use designations, and these criteria are used to determine whether a streams are in attainment of Clean Water Act goals. Weighting factors in Forms A and B relating to the existing and resulting aquatic life use are scaled relative to the quality of the streams falling under a given designation. Streams designated as LRW, MWH, or LWH by the Ohio EPA have been assessed and found to either have little or no ability to support aquatic life (LRW) or are impacted by either specific chemical water quality problems (LWH) or physical modifications to the habitat (MWH) which preclude the establishment of a well balanced warmwater aquatic communities of fish and macroinvertebrates. For purposes of assessing impacts to streams falling under these use designations, simplified default methodologies are utilized for determination of the mitigation requirements as described in Section 5.2.1.3. The methodology contained herein would allow applicants to utilize one of two different methodologies for evaluating the impacts to small streams that are not specifically designated with an aquatic life use in OAC Chapter 3745-1, and which meet the definition of a PHWH stream.

It is important to stress that the use of the methods outlined in this section for PHWH streams would only be applicable after a thorough evaluation of the stream has eliminated the possibility that other use designations currently promulgated in OAC Rule 3745-1-07 apply. The first method is to evaluate the impacts to the stream segment in question as if the stream segment is a designated WWH stream. Impact weighting factor scoring under this approach utilizes the WWH scoring criteria listed in the scoring sheet found in Form A, and follows the same subsequent scoring procedures throughout the evaluation process. This approach is consistent with current approaches for setting stream mitigation ratios, and is also reflective of the default designation of undesignated streams as General High Quality Waters under the antidegradation rule (OAC Rule 3745-1-05). The second approach is to utilize the evaluation procedures developed for PHWH streams developed by the Ohio EPA (Ohio EPA, 2002). Provisions for the use of the PHWH evaluation system have been provided in Form A to facilitate this alternative. The advantage for using the PHWH evaluation system is that it allows the applicant to utilize streamlined impact weighting factor calculations and alternative mitigation strategies for ephemeral and intermittent streams as outlined in Section 2.1.2.

5.2.1.1 Weighting Factors for WWH, EWH, CWH, and Class III PHWH Streams:

Weighting factors for stream segments which have been found to support or have the potential to support communities of aquatic organisms which meet the definition of WWH, EWH, Class III PHWH, and CWH range from 1.5 to 3.0 for impact analysis and from 0.1 to 1.0 for analysis of mitigation projects. The weighting factors are scaled relative to the sensitivity of the communities of aquatic fauna typically found within the use category to pollution and physical modification with respect to resource integrity. As illustrated in Table 1, the WWH aquatic life use designation applies to 77 percent of all of the designated stream miles in the state. Therefore, the WWH aquatic life use designation is assumed to be the average case for the development of adverse impact and mitigation weighting factors. Streams which contain exceptional or specially adapted
communities of aquatic fauna (EWH and CWH streams) comprise the great majority of the remainder, with SSH (see Section 2.1) waters comprising less than 1 percent of the state's designated stream miles.

Because streams which are classified as EWH, Class III PHWH, and CWH are rare, have a higher percentage of the populations of pollution intolerant organisms and species which are sensitive to habitat alterations, and have a greater potential provide habitat to rare and endangered species, the weighting factor for these streams in Forms A and B are scaled higher than that for WWH streams. Class III PHWH and CWH streams are given the highest weighting factor score (3.0) for the aquatic life use category because these stream segments are highly tied to sources of groundwater discharge which can easily be disrupted by alterations in channel morphology, earthmoving within or up-gradient of groundwater discharge areas, or changes within the riparian vegetation. Impacts within these Class III PHWH and CWH catchments often result in extreme changes in flow hydrology, sediment loading, and water temperature which ultimately result in loss of native fauna which are specially adapted to these cool and cold water environments.

5.2.1.2 Seasonal Salmonid Habitat (SSH):

The SSH aquatic life use was introduced in 1985 and is assigned to Lake Erie tributaries which are capable of supporting the passage of salmonids between October and May. Other appropriate use designations are applied to these streams during the remaining months of the year reflective of the type of aquatic life that can be supported. The Ohio DNR Division of Wildlife maintains a stocking program for steelhead trout *(Oncorhynchus mykis*), and several hundred thousand fry are released to streams in northeast Ohio every year. Runs of steelhead trout in the fall and spring provide high quality fishing opportunities along several Lake Erie tributaries. This fishery is also

economically important to the northeast Ohio region, as tourist dollars are attracted to the area. Streams designated as SSH represent a unique recreational resource within the State of Ohio, and special water quality criteria have been developed to protect this fishery (OAC Rule 3745-1-07). In order to properly weight impacts for projects proposed to SSH designated streams through the 401 Water Quality Certification process, an additional weighting factor of 0.2 is added on to the summertime "existing aquatic life use" designation in order to obtain a final aquatic life use impact weighting factor in Form A. Similarly, an additional weighting factor of 0.1 is added onto the "resulting aquatic life use" weighting factor for compensatory mitigation projects targeted for SSH listed streams.

As an example, if the June through October aquatic life use designation for a SSH stream is EWH, the final "existing aquatic life use" weighting factor (WF) in Form A for a proposed impact would be:

2.5 (EWH WF) + 0.2 (additional SSH WF) = 2.7 (final existing aquatic life use WF).

5.2.1.3 Default Methodologies for LRW, LWH, MWH, Class I PHWH, and Class II PHWH Streams:

As stated above, streams classified as LRW or Class I PHWH do not serve as habitat for well balanced communities of aquatic organisms. However, these waterways can play significant roles in the enhancement of downstream water quality through the assimilation of pollutants, the moderation of flows resulting from precipitation, and through the control of the export of sediment to downstream segments. Alterations to these streams which do not take these functions into account can cause cascading problems downstream with respect to water quality and quantity and can significantly disrupt sediment transport functions which are critical in the maintenance of balanced channel geomorphology and habitat integrity. Therefore, mitigation for stream segments falling into the LRW and Class I PWHW use designations would generally consist of the implementation of actions which will protect downstream water quality and in-stream uses. Form A has been designed to reflect this requirement by allowing applicants to mitigate for impacts to LRW or Class I PHWH streams through the implementation of appropriate post-construction best management practices which protect downstream water bodies. The requirements under these situations are outlined in Section 4.2.1 of this document.

Streams designated under the MWH or LWH aquatic life use do support communities of aquatic life, but at a level of performance less than that expected for WWH streams. These categorizations have been developed based upon findings that stream segments suffering from long lasting irretrievable modifications to either the physical habitat or

water chemistry of the stream precludes the potential for the stream to ever meet the level of integrity which can support the WWH aquatic life use. The LWH aquatic life use is limited to specific water bodies, and no additional water bodies in the state will be designated under this use category [see OAC Rule 3745-1-07 (B)(1)(b)]. For streams designated under the MWH and LWH uses, a default value of 3.0 for the stream impact weighting factor is used in Form A. This weighting factor is deemed to be appropriate across the spectrum of potential impacts for streams under these use designations, since the assignment of a stream segment under either of these categories acknowledges that the stream will not be able to fully meet Clean Water Act goals for aquatic life. In addition, streams falling under these designations cannot support primary contact recreation, and are not used as drinking water supplies, although protection of their agricultural and industrial water supply uses is appropriate. In completing the impact weighting factor analysis using Form A for streams in these categories, the default value of 3.0 is multiplied by the linear distance of impact to determine the total impact debits. Evaluation of other weighting factor criteria listed in Form A and described in the remainder of Section 5.2 of this document is not needed for these situations. See Section 5.1 for an overview of the impact weighting scoring tabulation.

In order to simplify the stream mitigation review process, stream segments found to meet the definition of Class II PHWH using the PHWH evaluation procedures (Ohio EPA, 2002) are also assigned a default weighting factor of 3.0 in Form A. Determination of the total impact debits for Class II PHWH streams is conducted using the same procedure as is used for MWH and LWH streams. This approach is appropriate because even though Class II PHWH streams do support communities of aquatic life, the overall integrity of these communities has been found to be limited as a result of flow conditions and the lack of available in-stream habitat (Ohio EPA 2002a, Ohio EPA 2002b, Ohio EPA 2002c).

5.2.2 Habitat Quality Weighting Factor:

In many situations, use attainability analyses may indicate that a stream reach has the potential to support a particular aquatic life use, but that site-specific conditions are temporarily creating conditions which cause non-attainment of applicable biological criteria for the use. Degradation of the in-stream habitat oftentimes is the underlying cause for this non-attainment condition when chemical water quality is not impaired. Habitat alteration and related consequences to stream ecosystems is listed as the single most pervasive cause of non-attainment in Ohio streams (Ohio EPA, 2000a).

In the context of carrying out the responsibilities of the Section 401 Water Quality Certification program, it is recognized that in many situations proposed impacts to streams will be occurring on stream segments which have already suffered impacts to

the in-stream habitat. In such situations, impact weighting factors in Form A are adjusted to properly account for habitat degradation which pre-dates activities for which an application is pending. Conversely, stream segments which possess good and excellent habitat quality merit additional protection through the weighting factor evaluation process since these areas possess characteristics most likely to be fully attaining Clean Water Act goals, and their protection has societal benefits with respect to overall maintenance of water quality and ecological integrity. Therefore, weighting factors for streams with higher quality habitat integrity are given higher impact weighting. Scores in Form A for Existing Habitat Quality range from 0.2 to 1.5 based upon an on-site evaluation conducted prior to any impact related to the proposed project which is subject to the Section 404/Section 401 application. A habitat quality ranking of "good" was used for the development of average case weighting factor scores.

Achieving a level of habitat quality which is sufficient to fully support defined aquatic life uses is a priority in the development of compensatory mitigation plans for streams. Specific goals for habitat quality should be fully described within the mitigation plans and design information submitted under the 401 Water Quality Certification application. Projects which include levels of design which provide better habitat for aquatic life following implementation are given greater weight in the "resulting habitat quality" weighting factor analysis in Form B, with scores ranging from 0.1 to 1.0.

Habitat quality is measured using either the Qualitative Habitat Evaluation Index or the Headwater Habitat Evaluation Index for PHWH streams as described in Sections 5.2.2.1 and 5.2.2.2 below. Habitat quality is categorized as "Excellent", "Good", "Fair", or "Poor" depending upon the QHEI or HHEI score, and weighting factor scores are adjusted accordingly. Stream segments categorized with "Poor" habitat would not be accepted for compensatory mitigation. Compensatory mitigation plans utilizing stream restoration or preservation must target habitat scores performing in the "Good" range or better. This also holds true for on-site stream relocation projects unless it can be demonstrated that site specific limitations prevent the attainment of this level of habitat quality.

5.2.2.1 Qualitative Habitat Evaluation Index:

The Ohio EPA has developed a methodology for the estimation of the quality of stream habitats for the support of aquatic life through the use of the Qualitative Habitat Evaluation Index (QHEI) (Rankin, 1989). The QHEI procedure is used in use attainability analyses to determine the potential to support well balanced fish communities, and can be used as an indicator of overall habitat quality. The QHEI is calibrated for streams with watershed areas greater than 1 mi^2 and pool depths greater than 40 cm, but has been found to not accurately predict habitat quality for streams with

smaller catchment areas or channel characteristics. For streams which do not meet these criteria, it is recommended that applicants utilize the Headwater Habitat Evaluation Index (HHEI) for Primary Headwater Habitat streams (Ohio EPA, 2002a) as described in Section 5.2.2.2.

For purposes of determining weighting factors under this document, habitat quality utilizing the QHEI procedures is categorized as follows:

Excellent Habitat Quality:	QHEI ≥75
Good Habitat Quality:	QHEI ≥60
Fair Habitat Quality:	QHEI ≥45
Poor Habitat Quality:	QHEI < 45

5.2.2.2 Headwater Habitat Evaluation Index:

As described in Section 2.1.2, Ohio EPA has developed methodologies for the evaluation for small headwater streams with watershed areas less than 1 mi^2 where existing methodologies, such as the QHEI, are inadequate to properly characterize the stream. In these small PHWH streams, a Headwater Habitat Evaluation Index (HHEI) has been developed for use in assessing the habitat quality to support aquatic life adapted to these ecosystems (Ohio EPA 2002a). For purposes of determining weighting factors for habitat quality utilizing the HHEI, weighting factor scores are determined as follows:

Excellent Habitat Quality:	HHEI ≥70
Good Habitat Quality:	HHEI ≥50
Fair Habitat Quality:	HHEI ≥30
Poor Habitat Quality:	HHEI <30

5.2.3 Priority Area Ranking:

The priority area ranking categorization utilized in the weighting factor calculation process is designed to integrate important identified values of stream segments proposed for impact or mitigation. Streams with high ecological, social, cultural, or economic value to the citizens of the state are given greater protection through this weighting factor. Three levels of weighting (Primary, Secondary, and Tertiary Priority) are utilized to distinguish the priority area ranking based upon existing conditions and designations. The “Secondary Priority” ranking was used for the development of average weighting factor scores.

Cases may arise where the Ohio EPA has reason to believe that conditions exist which meet the general definition for a particular priority category, but specific data necessary

to make a final determination are lacking. In such cases, applicants may be required to collect additional information regarding the stream segment of interest in order to make a final determination regarding the assignment of weighting factors.

5.2.3.1 Primary Priority:

These areas provide important contributions to biodiversity on an ecosystem scale or high levels of function contributing to landscape or human values. Impacts to these areas should be rigorously avoided or minimized. Compensation for impacts in these areas should emphasize replacement nearby and in the same immediate 14-digit watershed. Stream segments which are considered to be **primary priority areas** include:

- Stream segments within or located 2.0 stream miles upstream of National Estuarine Research Reserves.
- Stream segments designated as Wild or Scenic Rivers under the provisions of ORC Chapter 1517.
- Stream segments designated as Outstanding National Resource Waters, Superior High Quality Waters, or Outstanding State Resource Waters in accordance with OAC Rule 3745-1-05.
- Streams scoring >7 based upon the methodologies presented in the Ohio Department of Natural Resources Division of Wildlife document "Candidate Streams for Protection and Restoration" (ODNR, 2001) or the most recent revision thereof.
- Streams segments within or located 0.5 stream miles upstream or downstream of designated State or Federal Nature Preserves through which the stream flows.
- Streams where Federal or State listed threatened or endangered species are found.
- Stream segments designated as Public Water Supplies in accordance with OAC Rule 3745-1-07.
- Other stream segments identified by the Ohio EPA based upon ecological, social, or economic criteria which meet the definition of a primary priority area.

5.2.3.2 Secondary Priority:

Secondary priority areas include stream segments that are critical for the protection of Primary Priority Areas through the enhancement of stream ecosystem integrity and channel morphology characteristics. Also included within this definition are stream segments which have been identified as priority areas of non-attainment of Clean Water Act Goals under the provisions of Section 303(d) where further degradation of the in-stream character could contribute to a higher degree of non-attainment or preclude restorative activities necessary to improve water quality or the biological or physical integrity of the stream. Stream segments which are considered to be **secondary priority areas** include:

- Stream segments where Federal Species of Management Concern or Ohio declining fish species (as defined in OAC Rule 3745-1-05) are found.
- Stream segments which are within or are located 0.5 stream miles upstream or downstream of any park managed by the Ohio Department of Natural Resources Division of Parks and Recreation, a park district created pursuant to ORC Section 1545.01, or a National Park.
- Streams within or located 0.5 stream miles upstream or downstream of designated State or Federal Wildlife Areas.
- Stream segments designated as impaired in accordance with Section 303(d) of the Clean Water Act.
- Stream segments located within 0.5 stream miles upstream or downstream of primary priority reaches.
- Stream segments located within a delineated source water protection area identified in a Source Water Assessment and Protection Plan as developed under the requirements of Section 1453 of the Safe Drinking Water Act amendments of 1996.
- Streams scoring ≥ 3 and ≤ 7 based upon the methodologies presented in the Ohio Department of Natural Resources Division of Wildlife document "Candidate Streams for Protection and Restoration" (ODNR, 2001) or the most recent revision thereof.
- Other stream segments identified by the Ohio EPA based upon ecological, social, or economic criteria which meet the definition of a secondary priority area.

5.2.3.3 Tertiary Priority:

These stream segments include all other freshwater lotic systems not ranked as primary or secondary priority.

5.2.4 Existing Geomorphic Integrity

As part of the impact weighting process, an evaluation of the physical geomorphology of the existing stream channel prior to project related impacts must be conducted. As with the habitat evaluation process outline in Section 5.2.2 above, it is recognized that in many situations proposed impacts to streams will be occurring on stream segments which have already suffered impacts to the geomorphic integrity of the stream channel which are the result of prior upstream or downstream modifications which have nothing to do with the proposed project. In these cases, the impact weighting factors will be adjusted downward to reflect the existing conditions. The assessment process requires an analysis of the channel morphology as related to regional reference conditions and the criteria described below. In some cases, data regarding the stream channel dimension, pattern and flow equivalent to a "Level III" analysis as described in Rosgen (1996) must be collected for the stream segment to be impacted and compared to a reference stream conditions obtained from stable stream reaches of the same type and stream type.

General descriptions of the scoring categories used to determine the Geomorphic Integrity weighting factor are provided below. Additional analyses using the methodologies provided in Rosgen (2001) may also be helpful in assessing existing and predicted stream channel integrity. Weighting factor scores for this category range from 0.2 to 1.5. The "Good Functional Integrity" category was used as the average case for the development of weighting factor scores in Form A.

> **Excellent Functional Integrity (WF=1.5)** means that the physical geomorphology of the reach is stable and is representative of an appropriate stream hydrograph for the topographical setting. For purposes of document, a stream with "excellent functional integrity" is one that has not been channelized; has no culverts, pipes, impoundments, or other in-stream manmade structures on site; has one or no stream reaches within 0.5 miles upstream or downstream that have been culverted, piped, impounded, or otherwise modified by manmade structures; has an appropriate entrenchment ratio and width/depth ratio at bankfull discharge relative to natural, referenced stream conditions; shows little evidence of human-induced sedimentation; and has a wide riparian buffer of deep-rooted vegetation (>50' past the flood prone width of the stream).

Good Functional Integrity (WF=1.0) means that stability and resilience of the stream or river reach has is threatened, through partial loss of one or more of the integrity characteristics. System recovery has a high probability of occurring naturally, and such recovery is likely to occur within 5 years time given no further perturbations of the stream system. For purposes of this document , a stream is considered to have good integrity if the entrenchment ratio and/or width/depth ratio at bankfull discharge is appropriate relative to natural, referenced stream conditions; human-induced sedimentation is moderate; a good riparian buffer of deep-rooted vegetation is present (25-50 feet per bank past the flood prone width of the stream); and/or 1 reaches within 0.5 miles upstream or downstream has been culverted, piped, impounded, or otherwise modified by manmade structures.

Fair Functional Integrity (WF=0.5) means that stability and resilience of the stream or river reach has been compromised, to a limited degree, through partial loss of one or more of the integrity characteristics. System recovery has a moderate probability of occurring naturally, but such recovery is likely to take more than 5 years to occur. For purposes of this document , a stream is considered to have fair integrity if the entrenchment ratio and/or width/depth ratio at bankfull discharge is inappropriate relative to natural, referenced stream conditions; human-induced sedimentation is heavy; a moderate riparian buffer of deep-rooted vegetation is present (minimum of 25 feet past the flood prone width of the stream); and/or 1-2 reaches within 0.5 miles upstream have been culverted, piped, impounded, or otherwise modified by manmade structures.

Poor Functional Integrity (WF=0.2) means that there is a very high loss of system stability and resilience characterized by loss of one or more integrity characteristics. Recovery is unlikely to occur naturally without further damage, unless restoration is undertaken. For purposes of this document, a stream is considered to have poor functional integrity if the reach has been channelized or if the entrenchment ratio and/or width/depth ratio at bankfull discharge is inappropriate relative to natural, referenced stream conditions; has severe human-induced sedimentation; has little or no riparian buffer with deep-rooted vegetation (<25 feet past the flood prone width of the stream); has banks that are extensively eroded or unstable; and/or > 2 reaches within 0.5 miles upstream or downstream have been culverted, piped, impounded, or otherwise modified by manmade structures.

5.2.5 Floodplain Quality and Riparian Buffer Weighting Factors

As discussed in Section 4.3 and illustrated in Figure 1, impacts upon the forested riparian margins of stream often causes cascading degradation of stream channel integrity, habitat quality, and ecosystem stability. Scaling of the impacts of proposed projects subject to a Section 401 Quality Certification therefore must take into consideration the quality of the riparian and floodplain areas prior to the implementation of the proposed impacts upon these areas in order to properly account for overall impacts related to the project. Similarly, weighting of proposed mitigation projects is scaled based upon the provision of adequate floodplain areas and wooded riparian corridors[2] in order to account for actual benefit to be expected following implementation.

In order to simplify and unify the weighting factor assessment process, categorization of the quality of existing and mitigation riparian and floodplain areas are conducted using Table 3. The matrix provided within Table 3 integrates the width and quality of the wooded riparian corridor as well as the area of active floodplain to generate a narrative descriptor used in assigning scores for the "Existing Floodplain Quality" weighting factor in Form A, and for the "Riparian/Floodplain Preservation" and "Riparian Enhancement" weighting factors in Form B. Riparian area widths should be based upon the average width of the forested land adjacent to the stream channel on both banks throughout the area of impact or the mitigation area. Non-forested riparian areas and early successional stages of shrubby vegetation should not be considered when using the matrix. For purposes of use of the matrix, "active floodplain" is based upon an acreage measurement within the floodprone width of stream as delineated using procedures found in Rosgen (1996). The use of this measurement in the matrix accounts for variations in stream entrenchment and channel morphology to provide a relative weighting for the area where flooding routinely occurs under high flows, since these areas are most critical in moderating channel forming processes related to high flow events.

In some cases the flora or the physical condition of the landscape within the riparian corridor may be significantly degraded because of the presence of a high proportion of invasive plant species or as the result of previous landscape modifications within the area. In these situations, the classification of the Riparian/Floodplain Preservation weighting factor using Form A or B may have to be adjusted to provide less weighting than indicated using the riparian width and floodplain acreage matrix presented in Table 3. For mitigation proposals, the loss of credit under these circumstances can be recouped through riparian restoration and enhancement activities proposed in conjunction with the stream restoration, relocation, or preservation proposal (see Section 5.2.8).

[2]See footnote 1, page 18 for discussion regarding other natural riparian communities.

Table 3. Riparian and floodplain quality matrix for the assignment of weighting factors for stream impacts (Form A) and compensatory mitigation plans (Form B).

		Acres of Floodplain within the Flood-Prone Width Existing (Form A) or Preserved, Enhanced, or Restored (Form B)			
		<1	**1-5**	**>5-10**	**>10**
Average Width of Woody Riparian Existing (Form A) or Preserved, Enhanced, or Restored (Form B) per Bank	**25 ft.**	**Poor or Minimum**	Low	Moderate	Good
	>25-50 ft.	Low	Moderate	Good	Good
	>50-75 ft.	Moderate	Good	Good	Excellent
	>75-100 ft.	Good	Good	Excellent	Excellent
	>100 ft.	Good	Excellent	Excellent	Excellent
	Streamway (see Section 4.3)	Good	Excellent	Excellent	Excellent

In order to determine whether adjustment to the weighting factor scoring criteria for the floodplain quality and riparian buffer weighting factors is necessary, the following criteria should be used in conjunction with the evaluation methodologies detailed in Sections 5.2.5.1 and 5.2.5.2:

None/minimal (no adjustment to weighting factors necessary):

Riparian area consists of 75 percent or more coverage of mature wooded vegetation at appropriate densities based upon regional conditions. Native species of woody vegetation including a mix of trees and understory dominate the flora of the area to be preserved. Little evidence of disturbance (levees, urban development, mining, roadways, logging and clearing, oil and gas exploration, or agricultural tillage, etc.) exists within the riparian corridor. No enhancement or restoration activities necessary for long term maintenance of the wooded riparian stream buffer.

Moderate (adjustment of weighting factor by one scoring level appropriate):

Riparian area consists of 35 -75 percent or more coverage of woody vegetation at appropriate densities based upon regional conditions. Invasive species may be present, but levels of control necessary to ensure recovery of the wooded riparian are not extensive. Evidence of impacts to the riparian corridor (levees, urban development, mining, roadways, logging and clearing, oil and gas exploration, or agricultural tillage, etc.) exist, but the potential for natural recovery of the forested riparian is high without extensive restoration efforts. Riparian enhancement activities (stabilization plantings, invasive species control, tree and shrub plantings) have a high probability of success within a five year period following the implementation of mitigation activities.

Severe (adjustment of weighting factor by two scoring levels appropriate):

Riparian area consists of less than 35 percent coverage of woody vegetation at appropriate densities based upon regional conditions. Invasive species present at densities which require extensive control measures in order to ensure recovery of the forested riparian zone. Extensive evidence of impacts to the riparian corridor (levees, urban development, mining, roadways, logging and clearing, oil and gas exploration, or agricultural tillage, etc.) exist at a level where there is little potential for natural recovery of the forested riparian without extensive restoration efforts. Riparian restoration and enhancement activities (stabilization plantings, invasive species control, tree and shrub plantings) are necessary which will require monitoring and maintenance for more than five years following the implementation of mitigation activities.

The following sections detail scoring procedures and weighting factor interpretations for various applications of the impact and mitigation evaluation procedures using Forms A and B. Analysis of average weighting factor scores assumed a categorization of "Good" for both impact weighting factors and mitigation weighting factors.

5.2.5.1 Adverse Impact Weighting: Existing Floodplain Quality

Scoring values for the "Existing Floodplain Quality" weighting factor in Form A range from 0.2 to 1.5 using the narrative criteria found in Table 3 and the scoring outlined in Form A. Categorization using the matrix in Table 3 is based upon the condition of the wooded riparian area and the acreage of active floodplain within the floodprone width which existed prior to site activities associated with the Section 401 Water Quality Certification Application. In cases where it is evident that an applicant has altered the floodplain elevations or the condition of the wooded riparian corridor prior to the submission of the application to the Ohio EPA in order to reduce the weighting factor scores generated using Form A, a higher weighting factor score will be assigned based upon best available information regarding pre-construction conditions.

5.2.5.2 Stream Mitigation Weighting Factors: Riparian/Floodplain Preservation

The "Riparian/Floodplain Preservation" weighting factor is used in conjunction with the evaluation of all types of proposed stream mitigation, since all categories of mitigation must include perpetual protection of the mitigated stream segment and some associated riparian corridor. Since site specific differences are expected between potential mitigation sites with respect to the amount of floodplain and wooded riparian which will be preserved, weighting of projects according to this criteria is appropriate in order to ensure that appropriate mitigation is provided. Weighting factor scores applied under this category range from 0.0 to 1.0, and narrative categories are assigned using either the criteria listed in Table 3 or the descriptions provided below. For stream restoration projects and projects involving only stream preservation, the minimum acceptable width of preserved forested riparian area is 25 feet per bank for stream segments with watershed areas less than 20 mi^2 and 50 feet per bank for streams with watershed areas greater than 20 mi^2. For on-site stream relocation projects, forested riparian widths less than the minimum width would be acceptable on a case by case basis if the applicant can demonstrate that it is not practicable to provide at least the minimum buffer width, that the buffer width has been maximized wherever possible, and that sufficient additional off-site mitigation would be provided to compensate for the impact. No mitigation weighting factor credits are awarded for this category in such circumstances. "Average case" analysis for this mitigation credit weighting factor used a score of "Minimal" for stream relocation projects and "Moderate" for stream preservation and restoration projects.

Examples of excellent preservation actions (WF = 1.0):

- Preserving vegetated riparian buffers to accommodate the streamway of the stream or to a distance of at least three times as wide as the minimum buffer width on both sides of a stream if that distance is greater than the streamway.

- Preserving vegetated riparian buffers at least three times as wide as the minimum buffer width on both sides of a Primary Priority stream segment (Section 5.2.3.1).

Examples of good preservation actions (WF = 0.7):

- Preserving vegetated riparian buffers at least four times as wide as the minimum buffer width on one side of a stream or two times as wide as the minimum buffer width on both sides of a stream.

- Preserving a vegetated riparian buffer of at least the minimum buffer width on both sides or at least two times the minimum buffer width on one side of a Primary Priority stream segment (Section 5.2.3.1).

- Preserving vegetated riparian buffers at least two times as wide as the minimum buffer width on both sides of a Secondary Priority stream segment (Section 5.2.3.2).

Examples of Moderate preservation actions (WF = 0.4):

- Preserving vegetated riparian buffers at least three times as wide as the minimum buffer width on one side of a stream or to the minimum buffer width on the other side of a stream.

- Preserving vegetated riparian buffers of at least minimal buffer width on both sides or at least two times the minimum width on one side of a Secondary Priority stream segment (Section 5.2.3.2).

Examples of low preservation actions (WF = 0.2):

- Preserving vegetated riparian buffers at least two times as wide as the minimum buffer width on one side of a stream.

- Preserving a vegetated riparian buffer of at least minimum buffer width on one side of a Secondary Priority stream segment (Section 5.2.3.2).

Examples of Minimal preservation actions (WF = 0.0)

- Preserving stream channel, with buffer widths of at least 25 feet on both sides of stream with a watershed area less than 20 mi^2, or 50 feet for streams with watershed areas greater than or equal to 20 mi^2.

- Preserving vegetated riparian buffers of at least minimum buffer width on only one side of a stream as approved by the Ohio EPA on a case by case basis **(allowable only for approved stream relocation projects)**.

5.2.6 Adverse Impact Weighting Table: Impact Category

The Impact Category weighting factor is used only in the adverse impact analysis using Form A. Weighting factors for this step in the evaluation process range from 0.2 to 2.0, and are scaled into four categories based upon the relative disturbance that various types of activities have upon stream resource integrity and the length of stream channel affected by the proposed activity. Guidelines for assigning the scaling categories for particular projects is provided in Table 4. Impact types used in Table 4 are defined below:

Road Crossing means to route a stream through pipes, box culverts, or other enclosed structures. This term does not include crossings where the stream is crossed with a bridge and all constructed structures are placed outside of the ordinary high water mark of the stream channel.

Enhanced culverts are structures that approximate the stream's width/depth ratio at bankfull discharge which have natural stream substrates and which present only minimal impediments to the migration of aquatic fauna. Floodplains, if present, should be adequately culverted at an elevation equal to or greater than bankfull to pass flows.

Standard Culverts are structures of appropriate size to pass bankfull discharge but that are not specifically designed to approximate the stream's width/depth ratio at bankfull discharge or to minimize potential impacts to fish movements.

Fill means permanent fill of a stream channel (most often associated with stream relocation).

Relocation means to create a new stream channel to convey the stream flows away from the natural or existing stream channel in order to facilitate development, to alter hydrologic conditions or otherwise cause a permanent abandonment of an existing stream channel from flowing water, or to enclosed

Table 4. Impact weighting factor categorization table (see Section 5.2.6).

Minimal Impact WF=0.2	**Moderate Impact WF=1.0**	**High Impact WF=1.5**	**Severe Impact WF=2.0**
Road Crossing: Enhanced Culvert <150 feet	Road Crossing: Enhanced Culvert 150-300 feet	Road Crossing: Enhanced Culvert >300 feet (only applicable if fish passage possible)	- - -
- - -	Road Crossing: Standard Culvert <50 feet	Road Crossing: Standard Culvert 50-150 feet	Road Crossing: Standard Culvert >150 feet
- - -	Fill/Relocation <50 feet	Fill/Relocation 50-150 feet	Fill/Relocation >150 feet
Impoundment Temporary: <150 feet, <6 months duration	Impoundment Temporary: <150 feet, 6-12 months duration or >150 feet, < 6 month duration	Impoundment Permanent: Impounded areas <300 feet and fish passage possible	Impoundment Permanent: Impounded areas ≥300 feet or fish passage impossible
- - -	Morphological Alteration <150 feet	Morphological Alteration 150-300 feet	Morphological Alteration >300 feet
Armor <50 feet	Armor 50-150 feet	Armor 150-300 feet	Armor >300 feet
Shading/Clearing <300 feet	Shading/Clearing 300-600 feet	Shading/Clearing >600 feet	- - -
Utility Crossing <150 feet	Utility Crossing 150-300 feet	Utility Crossing >300 feet or Multiple Crossings >300 feet	- - -
Other Temporary Impacts <300 feet, <6 months duration	Other Temporary Impacts <300 feet, 6-12 months duration or >300 feet, < 6 month duration	Other Temporary Impacts > 300 feet, 6-12 months duration	

stream flow into a culvert or other conveyance for a purpose other than the installation of a road crossing.

Impound means to dam a stream or otherwise convert it to a lentic state. Installation of sediment control structures that modify the stream to facilitate sediment control and/or stormwater management is considered impoundment.

Morphologic alteration means to channelize, dredge, or otherwise alter the established or natural dimensions, depths, or limits of a stream channel. **Armor** means to rip-rap, bulkhead, or use other rigid methods to contain stream channels.

Shading and clearing means activities, such as bridging or streambank vegetation clearing, that reduce or eliminate the quality and functions of the vegetation within the riparian habitat without disturbing the existing topography or soil stratigraphy. Although these impacts may not be directly regulated, mitigation for these impacts may be required if the impact occurs as a result of, or in association with, an activity requiring a permit.

Utility crossings means open cut construction or other pipeline/utility line installation methods that require disturbance of the streambed.

Other Temporary Impact means projects which have been reviewed by the Ohio EPA and have been found to have little or no permanent (>12 month) consequences with respect to the attainment of aquatic life use criteria or geomorphic integrity of the stream and which do not meet any of the other definitions provided above. One such example for this category would be the temporary de-watering of a stream channel to facilitate another activity that will have only temporary impacts on the stream.

For the purposes of analyzing “average” case impact/mitigation relationships, an impact category of “Severe” was assumed. This level was chosen in order to provide reasonable worst-case comparisons between assigned impact credits and the allocation of offsetting mitigation credits.

5.2.7 Stream Mitigation Weighting Factors: Stream Channel Restoration, Stream Relocation or Barrier Removal

The Stream Channel Restoration, Stream Relocation, or Barrier Removal weighting factor is used only for the stream mitigation weighting factor analysis found in Form B. This weighting factor is used to evaluate portions of the credit allocation for compensatory mitigation projects which include either the restoration of degraded

stream channels (Section 5.2.7.1), on-site relocation of stream channels (Section 5.2.7.2), or the removal or modification of in-stream structures which cause degradation of habitat quality or stream geomorphology (Section 5.2.7.3). Five categories are provided in Form B under this weighting factor, with potential weighting factor scores ranging from 0.0 to 3.0. Compensatory mitigation proposals which include only stream preservation activities with no proposed stream restoration activities for stream banks or within the channel are automatically given a score of 0.0 (None) for this weighting factor. The average case for stream restoration design and is considered to be the "Moderate" category (WF=1.0) while the "Minimal" category (WF = 0.5) was assumed for stream relocation projects. The assignment of the "Minimal" category for the average case analysis of stream restoration projects is appropriate since the design of relocated streams is often determined by the constraints of site space limitations rather than natural channel design concepts.

For mitigation projects including stream relocation or restoration activities, an analysis must be conducted regarding the design of the new or restored stream channel with respect to its post- construction integrity and likelihood of the stream segment to reach its highest potential over time without additional maintenance activities. General guidelines for the evaluation of these types of compensatory mitigation projects is provided in Sections 4.2.2 (stream relocation) and 4.2.3 (stream restoration). Of particular importance in reviewing proposals for stream relocation or restoration is analysis of the proposed improvements with respect to stream geomorphic integrity for the mitigation stream segment relative to its starting point in light of the stream evolution concepts outlined in Table 2 and the pre-mitigation state of the stream segment using the criteria presented in Section 5.2.4. This analysis is used as the basis for awarding stream mitigation credits through the weighting factor analysis process. For stream restoration proposals where significant barrier structures such as dams or long culverts (>200 feet in length) will be either removed or modified, an in-depth analysis of the project would need to be conducted which would account for the existing stream conditions and impacts of the dam structure on overall water resource integrity. Coordination of these efforts with in-place water quality improvement plans, TMDL studies, flood control projects, wildlife management plans, and management plans for rare, threatened and endangered species is also critical.

As mentioned in Section 5.0, it is recognized that stream restoration projects where significant improvements in floodplain connectivity, stream channel geomorphology, or bank stability will result, the integrity of upstream and downstream stream segments may also improve. Improvements in biological integrity and water quality may also occur which benefit stream reaches outside of the actual project area. Removal of barriers to migration of native fauna may also open new areas of reproductive habitat and allow connectivity between tributary systems which were formerly isolated from each other. In mitigation scenarios where these additional benefits can be predicted to

occur, a mechanism has been provided in Appendix C to allocate additional mitigation credits for the restoration project based upon the anticipated environmental benefit which will be transferred to adjacent upstream and downstream segments.

5.2.7.1 Stream Restoration Scoring:

Only three of the categories in the weighting factor apply to mitigation proposals for stream restoration: "Excellent", "Good" and "Moderate" as defined below:

Excellent (WF=3.0): Based upon the restoration plan presented, it can be demonstrated that the integrity of the restored stream segment will improve at least from an existing geomorphic integrity rating of "Fair" to "Excellent" or from "Poor" to "Good" given the criteria listed in Section 5.2.4 within a reasonably short period of time (5 years). With respect to the stream channel evolution model presented in Table 2, movement to the right along the restoration continuum axis of at least two columns from the existing condition can be expected (e.g. from "eliminated channel" to a "vertically stable channel" or from a "channel with declining stream quality" to a "geomorphically fit channel").

Some examples of excellent stream restoration actions include:

- Restoring stream channels with poor integrity to referenced, stable morphologic patterns.
- Restoring appropriate bankfull discharge width, stream sinuosity, entrenchment ratio, gradient and width/depth ratio to referenced morphologic patterns.
- Creating floodplains of appropriate dimensions adjacent to streams with inappropriately low width/depth ratios at bankfull discharge based upon comparison to stable referenced morphologic conditions.

Good (WF=2.0): Based upon the restoration plan presented, it can be demonstrated that the integrity of the restored stream segment will improve at least from an existing geomorphic integrity rating of "Poor" to "Good", from "Fair " to "Good", or from "Good" to "Excellent" given the criteria listed in Section 5.2.4 within a reasonably short period of time (5 years). With respect to the stream channel evolution model presented in Table 2, improvement along the restoration continuum axis of at least one column to the right of the existing condition can be expected as long as the resulting channel is designed to be at least vertically stable (e.g. restoration will convert a channel experiencing declining stream quality to a vertically stable channel, etc.).

Some examples of good stream restoration actions include:

- Restoring stream bank stability using non-rigid methods in highly eroded areas.
- Restoring natural channel features (i.e., riffle/run/pool/glide habitat) using methodology appropriate to stream type.
- Removing culverts (<200 feet), checkdams, weirs, and other manmade in-stream structures where these structures are contributing to unstable stream conditions such as bank erosion or scour.

Moderate (WF=1.0): Based upon the restoration plan presented, it can only be demonstrated that the integrity of the restored stream segment will be maintained at the existing Geomorphic integrity rating given the criteria listed in Section 5.2.4, but that further degradation of the stream segment (movement to the left along the restoration continuum axis in the stream channel evolution model presented in Table 2) will be prevented through the implementation of the stream restoration plan. Projects ranked as "Moderate" under this weighting factor have a limited probability of additional improvements in geomorphic integrity occurring naturally within 5 years of the implementation of the mitigation project.

Some examples of moderate stream restoration actions include:

- Restoring stream bank stability in moderately eroded areas.
- Culverting floodplains at existing road crossings to allow more natural flood flows.
- Adding woody debris to create fish habitat, where appropriate to stream type.
- Replacing inappropriately sized/designed culverts.

5.2.7.2 Stream Relocation Design Scoring

The general goals for projects which involve stream relocation is presented in Section 4.2.2 of this document. As mitigation for unavoidable impacts to streams which require the filling of the existing stream channel, on-site relocation of a properly designed stream channel will often be the preferred mechanism for the provision of compensatory mitigation to maintain overall stream integrity following the completion of the proposed project. Relocated streams should reflect the dimension, pattern,

substrate characteristics, and profile of natural, referenced stable conditions for the stream in question and have at least a 25' buffer from the point on the stream bank which delimits the flood prone width of the channel. In the case where the relocation involves a PHWH stream, the riparian buffer should extend at least 25' from the point on the stream bank which delimits the flood prone width of the channel unless the drainage divide is located less than 25' from the flood prone width boundary, in which case the riparian buffer should be extended to the drainage divide. Stream relocation projects which provide for only the minimum buffer widths would not receive additional riparian buffer restoration credit (see Section 5.2.5).

A well-designed relocated stream has an appropriate geomorphic dimension, pattern and profile in comparison to stable referenced stream conditions, maintains the capacity to transport bedload sediment, and is constructed with at least a 25' riparian buffer on each side of the stream bank past the flood prone width of the stream. A minimally-designed relocated stream has an appropriate geomorphic dimension, pattern, and profile and the streambanks are stabilized with tree revetments, willow plantings, or other non-rigid measures. No mitigation credit is generated for relocated streams that are rip-rapped, constructed with concrete, or which will serve primarily as storm water conduits. The assignment of weighting factor scores for stream relocation project design is conducted using the same criteria as those used for stream restoration projects (Section 5.2.7.1) except that on a case-by-case basis, minimal design scoring (WF= 0.5) may be allowed if the applicant can demonstrate that site-specific limitations prevent a relocation design which provides for moderate, good, or excellent design criteria.

5.2.7.3 Barrier Removal

Stream restoration proposals involving the removal of barriers such as dam structures or the daylighting of long (>200 feet) culverted stream segments are considered as special case projects which are scored according to a different set of criteria with respect to the Stream Channel Restoration, Stream Relocation or Barrier Removal weighting factor. Since it is impossible to generalize all of the potential conditions, settings, and design features involved with these barrier removal projects, considerable latitude is provided to the individual 401 Coordinator to score these projects. Some general guidelines with respect to weighting factor categorization are provided in Table 5, but these guidelines should not be considered exhaustive.

Issues which must be considered when allocating credits for barrier removal under this weighting factor are the existing (pre-implementation) conditions of the stream with respect to aquatic life use, impacts of the structure on migratory and spawning activities of fish and other native fauna, potential impacts on rare, threatened and endangered species, potential water quality impacts, impacts with respect to bedload sediment

Table 5. Weighting factor scoring guidelines for barrier removal projects.

Minimal (WF = 0.5)	**Moderate (WF = 1.0)**	**Good (WF = 2.0)**	**Excellent (WF = 3.0)**
Removal of barrier where additional natural or artificial barriers to fish migration exist within close proximity (within ½ stream miles upstream or downstream) to the project.	Opening of additional spawning habitat for native fauna where it can be documented that the dam structure is an impediment to natural migration patterns.	Opening of additional spawning habitat for Federal Species of Management Concern or Ohio declining fish species (as defined in OAC 3745-1-05) are found.	Opening of additional spawning habitat for State or Federally listed threatened or endangered species.
Removal or modification of barrier structures where only minimal benefit can be demonstrated with respect to stream geomorphic integrity, biological integrity, dissolved oxygen regime, or bedload sediment transport (rating of Excellent Functional Integrity using the criteria listed in Section 5.2.4).	Removal of structures where it can be demonstrated that there will be an improvement in D.O. regime where D.O. violations have been documented, but where the stream segment is in attainment of applicable biocriteria.	Removal of structures where it can be demonstrated that there will be an improvement in D.O. regime where D.O. violations have been documented, but where the stream segment is in partial attainment of applicable biocriteria.	Removal of structures where it can be demonstrated that there will be an improvement in D.O. regime where low D.O. is listed as a cause of non-attainment or as a reason for 303 (d) listing.
	Removal or modification of barrier structures where upstream or downstream geomorphic integrity is somewhat impaired due to alterations of flow or bedload transport (rating of Good Functional Integrity using the criteria listed in Section 5.2.4) caused by the structure.	Removal or modification of barrier structures where upstream or downstream geomorphic integrity is impaired due to alterations of flow or bedload transport (rating of Fair Functional Integrity using the criteria listed in Section 5.2.4) caused by the structure.	Removal or modification of barrier structures where upstream or downstream geomorphic integrity is severely impaired due to alterations of flow or bedload transport (rating of Poor Functional Integrity using the criteria listed in Section 5.2.4) caused by the structure.
Partial removal of barrier structures where significant velocity barriers will impede fish migration or where channel restrictions will prohibit natural channel migration patterns.	Partial removal of barrier structures where minimal velocity barriers will exist to impede fish migration but where remaining channel restrictions will prohibit natural channel migration patterns.	Complete removal of barrier structures on waters designated as Warmwater Habitat, or General High Quality Waters where such removal will restore natural channel migration patterns, bedload transport, and fish migratory patterns.	Removal of barrier structures on waters designated as Exceptional Warmwater Habitat, Cold Water Habitat, Superior High Quality Waters, Outstanding National Resource Waters, or Outstanding State Resource Waters where such removal will restore natural channel migration patterns, bedload transport, and fish migratory patterns.
Retrofitting of dams with fish passage devices where there is a moderate probability of improving fish migration for State or Federally listed threatened or endangered fish species, Federal Species of Management Concern or Ohio declining fish species (as defined in OAC 3745-1-05).	Retrofitting of dams with fish passage devices where there is a high probability of improving fish migration for State or Federally listed threatened or endangered fish species, Federal Species of Management Concern or Ohio declining fish species (as defined in OAC 3745-1-05).		

transport, and impacts on stream geomorphic integrity. Other factors which should be considered are the degree of conformance to sound channel design protocols in order to ensure that removal of the structure does not de-stabilize stream segments upstream or downstream of the proposed project, and whether or not the dam removal project has been identified as a priority for wildlife or water quality management by the Ohio DNR or the Ohio EPA. The degree to which stream integrity will be improved following barrier removal will be quite variable between sites, and mitigation credits allocated for these projects should reflect the amount of overall environmental benefit to be realized.

It is important to note that the initial scoring of the mitigation project using Form B should be based solely upon the primary mitigative area (see Appendix C) which includes the area of direct immediate benefit from the dam removal project. This area is typically the dam site, stream channel segments immediately downstream which must be stabilized to accommodate the project, and the dam pool and backwater affected stream segment. Additional credits for secondary and tertiary mitigative benefits are calculated using Form C based upon the initial Form B scoring as described in Appendix C.

5.2.8 Stream Mitigation Weighting Factors: Riparian Restoration and Enhancement

For compensatory mitigation projects where the condition of the riparian corridor is found to have moderate to severe levels of degradation, as defined in Section 5.2.5, opportunity exists to increase the mitigation credit allocation through riparian enhancement or restoration efforts. For purposes of this document, riparian restoration projects are considered to be those whereby a plan is developed to rehabilitate an area ranked as severely degraded to a naturalized condition, while an enhancement project is considered to be efforts to speed the process of recovery for moderately degraded systems. From an implementation standpoint, the major difference between the “enhancement” and “restoration” of the riparian corridor is that a restoration project would require greater level of effort for implementation as well as schedules for maintenance and monitoring activities exceeding five years in duration to a point where recovery of the forested riparian corridor can proceed naturally. Restoration activities might also include the terracing and re-planting of floodplains to allow greater connectivity of the stream to its floodplain during high flow events, as appropriate for the stream setting and flow conditions, or extensive riparian plantings of native trees and shrubs which would significantly increase the width of forested riparian within the streamway.

Scoring values for the Riparian Restoration and Enhancement weighting factor range from 0.0 (no activities planned in association with the mitigation project) to 1.0. The “average case” scoring for this weighting factor is considered to be the “Minimal” category for stream preservation projects, “Moderate” for stream restoration projects, and “None” for relocation projects. Guidelines for the categorization of compensatory

mitigation plans including riparian restoration and enhancement are provided below:

None (WF = 0.0): no plans are provided for the control of invasive species, planting of native flora, or the monitoring within the riparian corridor beyond the initial characterization provided to justify scoring for the existing riparian and floodplain quality and minimal general requirements specified in Section 7.0 of this document. Protective measures in place through deed restrictions or conservation easements are sufficient to maintain the quality of the riparian corridor in its existing condition.

Minimal (WF = 0.2): plans are provided to control invasive plant species for the duration of the five year monitoring period and to monitor the effectiveness of these efforts, but that no plantings to improve riparian quality or efforts to improve the connectivity of the stream to its floodplain are planned.

Moderate (WF = 0.4): enhancement plans are provided to control invasive plant species for the duration of the five year monitoring period and to monitor the effectiveness of these efforts. Plantings of native flora will be implemented to improve riparian quality or efforts to improve the connectivity of the stream to its floodplain are planned. The level of effort included in the compensatory mitigation plan is sufficient to stabilize and maintain the riparian corridor at a level where the riparian and floodplain quality evaluation using the criteria provided in Section 5.2.5 and Table 3 of this document will be maintained.

Good (WF = 0.7): enhancement plans are provided to control invasive plant species for the duration of a specified maintenance period of at least five years in duration and to monitor the effectiveness of these efforts. Plantings of native flora will be implemented to improve riparian quality or efforts to improve the connectivity of the stream to its floodplain are planned. The level of effort included in the compensatory mitigation plan is sufficient to improve the riparian and floodplain quality weighting factor scoring using the criteria provided in Section 5.2.5 and Table 3 of this document by at least one category within the maintenance and monitoring period which may be extended to ensure success of the project.

Excellent (WF = 1.0): restoration plans are provided to control invasive plant species for the duration of a specified maintenance period which exceeds five years in duration when necessary to ensure success and to monitor the effectiveness of these efforts . Extensive plantings of native flora will be implemented to improve riparian quality or large-scale efforts to improve the connectivity of the stream to its floodplain are planned. The level of effort included in the compensatory mitigation plan is sufficient to improve the riparian and floodplain quality weighting factor scoring using the criteria provided in Section 5.2.5 and Table 3 of this document by at least two categories within the maintenance and monitoring period which is sufficiently extended to ensure success of the project.

Plans for invasive species control, planting, and monitoring of riparian restoration and

enhancement projects must be incorporated into the mitigation plan and submitted to the Ohio EPA for approval. The general criteria for the development of these plans is described in Sections 6.0, 7.0, and 8.0 of this document.

5.2.9 Stream Mitigation Weighting Factors: Watershed Location

As indicated in Section 4.1, the number of mitigation credits allocated using Form B analysis will be higher for projects where mitigation is conducted on-site or within close proximity to the location where authorized impacts will occur. In order to provide a common framework for the consideration of proximity, hydrologic unit maps developed by the USDA Natural Resources Conservation Service (NRCS) and the U.S. geological Survey are used to delineate watershed boundaries. Under this system watersheds are coded by a hydrologic unit code (HUC) system, with regional, watershed, and sub-watershed units identified under 8 digit, 11 digit and 14 digit codes (Seaber et. al, 1987). Under this system, greater numbers of digits included in the HUC code indicate smaller watershed units. Hydrologic unit maps can be obtained via the internet at the following addresses:

http://water.usgs.gov/GIS/huc.html

http://www.oh.nrcs.usda.gov/waterres/

Hydrologic unit maps are readily available for all 88 counties in Ohio to the 14 digit HUC level. The HUC 8 and 11 digit watershed boundaries for Ohio are presented in Figure 3. An example hydrologic unit county map showing 11 digit and 14 digit HUC boundaries is presented in Figure 4.

Weighting factor scoring for the watershed location category ranges from 0.0 to 1.0 as described below. For average case weighting factor analysis, the scoring categories chosen were the “Within HUC 11" location for stream restoration and stream preservation scenarios, and the “On-Site” scoring category for mitigation projects involving stream relocation.

> **On-Site (WF = 1.0):** means that the mitigation site is located within the property boundary where the impact will occur. Mitigation proposals which involve segments of the impacted stream within 1,500 linear feet of channel upstream or downstream of the impact location also qualify as on-site mitigation.
>
> **Within HUC 14 Watershed (WF = 0.8):** means that the mitigation site is located within the 14-digit HUC watershed where the impact will occur as mapped by USDA-NRCS.
>
> **Within HUC 11 Watershed (WF = 0.5):** means that the mitigation site is located outside of the 14-digit HUC watershed but within the same 11-digit HUC watershed where the impact will occur as mapped by USDA-NRCS.

Figure 3. Hydrologic units for the State of Ohio at the HUC 8 and HUC 11 mapping scale.

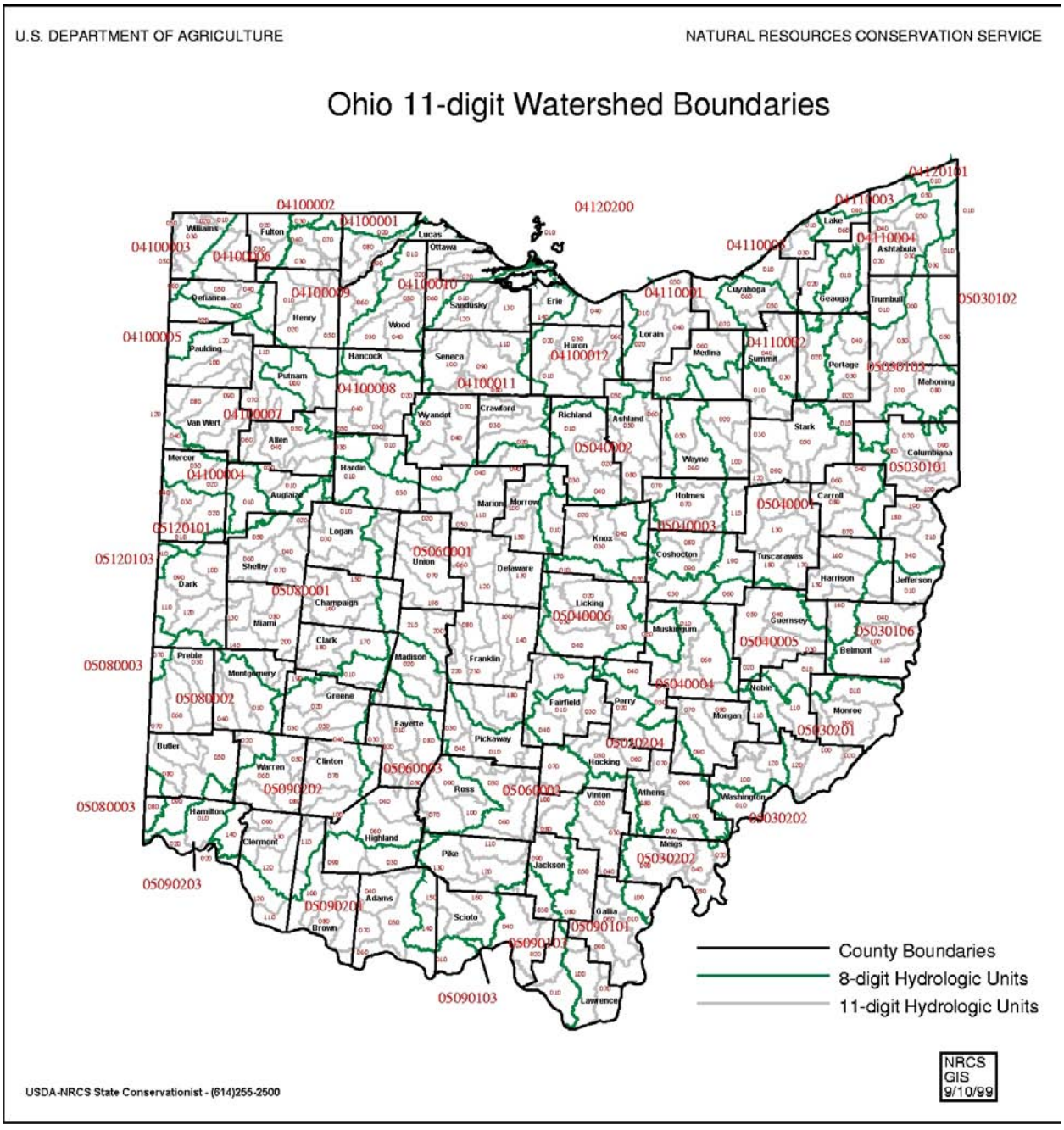
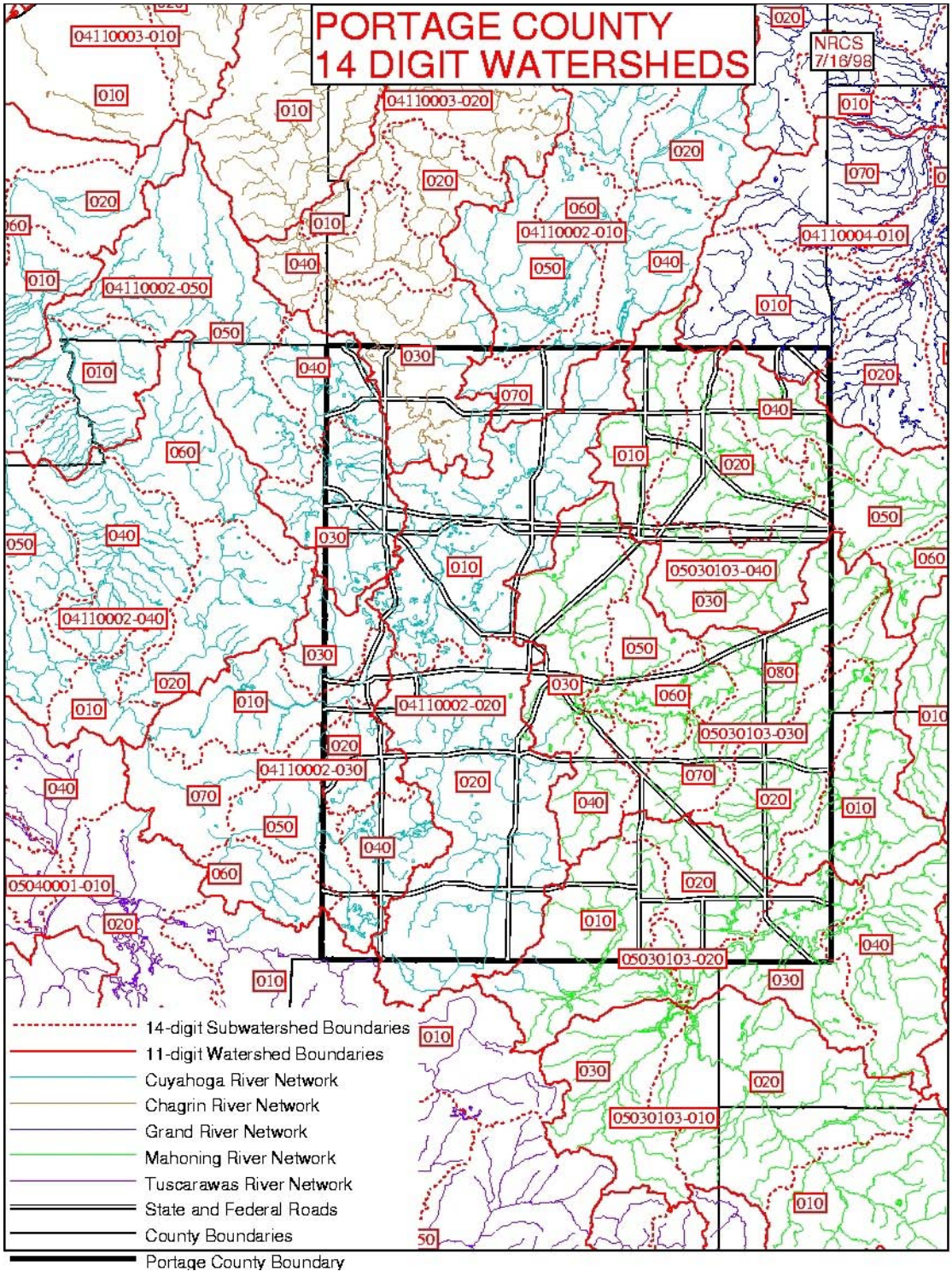


Figure 4. Hydrologic unit map for Portage County at the HUC 11 and HUC 14 mapping scale.



Within HUC 8 Watershed (WF = 0.3): means that the mitigation site is located outside of the 11-digit HUC watershed where the impact will occur but within the same 8-digit HUC watershed as mapped by USDA-NRCS.

Outside Watershed (WF = 0.0): means that relative to the site of the impact, the mitigation site is located outside of the 8-digit HUC watershed where the impact will occur, as mapped by USDA-NRCS. Distant or out-of-watershed compensatory mitigation must be approved on a case-by-case basis.

5.2.10 Stream Mitigation Weighting Factors: Control

The following definitions apply as related to the type of control placed upon the mitigation site following the implementation of the mitigation plan. Weighting factors for this category under the scoring procedures used in Form B have been assigned based upon the relative degree of protection afforded under each mechanism. All off-site stream restoration and preservation mitigation sites would need to be protected in perpetuity through a fee simple title of deed or a conservation easement held by a non-profit conservation organization or government agency with natural resource or environmental responsibilities/functions. The exception to this requirement is in the case of limited term mitigation projects as outlined in Section 4.4.1 of this document, which describes circumstances where limited term easements may be sufficient to facilitate the implementation of mitigation. Section 4.4 presents the general requirements for perpetual protection of stream mitigation areas. Weighting factor scoring for the “Control” category range from 0.0 to 0.5. The average case for all mitigation scenarios was assumed to be the use of conservation easements for long term protection. Weighting factors for the three types of legal mechanisms for protection of stream mitigation sites are assigned as follows:

Fee Simple (WF = 0.5): means that the mitigation site is owned directly by the conservation organization, park district, government agency, or other approved organization which will hold such ownership in perpetuity and which will provide protection in perpetuity for the stream channel, stream bank and approved buffer provided for in the approved mitigation plan for the site.

Conservation Easement (WF = 0.3): means that the site is protected either through a formal agreement between a land owner and a conservation organization, park district, government agency, or other approved organization which will hold such rights in perpetuity and which provides protection in perpetuity for the stream channel, stream bank and approved buffer provided for in the approved mitigation plan for the site.

Deed Restriction (WF = 0.0): means that the site is protected by a restrictive covenant within the deed for the property which has been set aside under the approved mitigation plan.

5.2.11 Stream Mitigation Weighting Factors: Impact/Mitigation Relationship

As stated in Section 4.1, one of the goals for designing off-site mitigation projects should be to target mitigation within stream segments of the same general watershed size as the stream which is being impacted whenever possible. Weighting factor scoring for the categorization of the Impact/Mitigation Relationship are outlined below. For average case analysis, in-kind mitigation scoring was assumed for all mitigation scenarios.

In-kind mitigation (WF = 0.5): means the lost functions of the impacted stream will be mitigated through restoration or preservation of a stream of the same aquatic life use designation, within the same general stream order, and with a similar morphological classification.

Out-of-kind mitigation (WF = 0.1): means the lost functions of the impacted stream will be mitigated through restoration or preservation of a stream with a different aquatic life use designation, morphological classification, or stream order ($\geq$2 stream order difference).

5.2.12 Stream Mitigation Weighting Factors: Implementation Schedule

In most cases, mitigation should be completed prior to or concurrent with the activities causing adverse impacts. The preferred method is to complete mitigation prior to the commencement of the impacts. However, it is recognized that in many cases it may be necessary to perform the mitigation concurrent with or using differing schedules within the overall project. This is usually acceptable provided the time lag between the impacts and mitigation is minimized and the mitigation is completed within one growing season following commencement of the adverse impacts. In order to encourage proper scheduling of mitigation activities, additional mitigation credit is given for projects which precede activities causing adverse impacts according to the following scoring scheme:

Implementation Schedule:

Schedule 1 **(WF = 0.3):** All mitigation is completed before the impacts occur.

Schedule 2 **(WF = 0.2):** A majority ($\geq$60%) of the mitigation is completed immediately before the impacts (i.e. within 3 months), and the remainder is completed concurrent with or after the impacts occur.

Schedule 3 **(WF = 0.1):** A majority ($\geq$60%) of the mitigation is completed concurrent with the impacts (i.e. within 3 months after the impact), and the remainder is completed after the impacts occur.

***Schedule 4* (WF = 0):** A majority of the mitigation (≥60%) is initiated within 3 to 6 months after the impacts occur.

***Schedule 5* (WF= -0.1):** Mitigation will be completed significantly after the impacts occur (i.e. more than 6 months after the impact).

Schedule 2 was used as the "average case" weighting factor in Section 5.4 for preservation and restoration activities, while Schedule 3 was used for stream relocation.

5.2.13 Stream Mitigation Weighting Factors: Supplemental Water Quality Activities

Supplemental Water Quality Activities are activities conducted over and above the minimum requirements for stream restoration, stream preservation, or riparian area restoration and enhancement mitigation projects which are designed to improve water quality by reducing the loadings of nutrients, suspended solids, or other pollutants or to reduce peak runoff flows where it can be demonstrated that such activities will improve stream ecosystem function or morphological stability. The purpose of providing this weighting factor into the stream mitigation matrix is to provide incentive for applicant to capitalize upon opportunities for conducting water quality improvement activities coincident with stream mitigation projects. Weighting factors for this credit range from 0.0 to 0.4. For purposes of analyzing the average case mitigation scenario, it was assumed that no supplemental water quality activities would be performed (WF = 0.0).

Categories for the Supplemental Water Quality Activities weighting factor are listed below, as well as specific examples of the types of activities that are considered to fall under each category. On a case-by-case basis, the Ohio EPA can consider other types of activities not listed below and categorize them accordingly. Examples include the provision of public access to streams in areas where access to streams with significant recreational value is impaired or projects which facilitate significant regional educational or research opportunities regarding stream ecosytems. Proposals for these types of projects should be supported by state, regional, or federal conservation agencies such as ODNR or metropolitan park districts. The purpose of this weighting factor is to encourage the incorporation of such activities, and to foster the use of creative measures to improve water quality. Since mitigation activities often mobilize resources which may not normally be available in given locales, efficient use of these resources to accomplish water quality improvements is a priority.

Excellent Supplemental Water Quality Activities (WF = 0.4):

- Construction of off-channel stormwater detention facilities in areas where runoff is accelerating stream bank erosion or otherwise causing morphologic instability. Off-channel storm water detention facilities should not be placed in jurisdictional wetlands, forested flood plains, or riparian buffer areas.

- Watershed improvement actions, such as sediment reduction (i.e., conversion of agricultural use to forested riparian use in buffer areas), nutrient loading reductions (i.e. removal of livestock access to streams), contaminant reduction, and storm water surcharge reduction.

- Implementing restoration activities that will improve water quality or reduce sedimentation in streams designated as Outstanding National Resource Waters, Superior High Quality Waters, Outstanding State Resource Waters, or in streams where Federal or State listed endangered or threatened species are found.

- Fencing livestock from a riparian buffer at least 75' wide on both sides of a stream, if one or more livestock crossings are planned, or from a buffer 50' wide on both sides of a stream if no livestock crossings are planned.

Good Supplemental Water Quality Activities (WF = 0.2):

- Reducing non-point pollution sources by methods other than buffering.

- Implementing restoration activities that will improve water quality or reduce sedimentation in streams designated as General High Quality Waters, or in streams where Federal Species of Management Concern or Ohio declining fish species (as defined in OAC Rule 3745-1-05) are found.

- Fencing livestock from a riparian buffer at least 50' wide on both sides of a stream, if one or more livestock crossings are planned, or from a buffer 25' wide on both sides of a stream if no livestock crossings are planned.

Moderate Supplemental Water Quality Activities (WF = 0.1):

- Fencing livestock from a riparian buffer at least 25' wide on both sides of a stream (with livestock crossings planned) or 75' wide on one side of a stream (no livestock crossings planned).

- Fencing livestock from a riparian buffer at least 75' wide on one side of a stream, if one or more livestock crossings are planned, or from a buffer 50' wide on one side of a stream if no livestock crossings are planned.

5.2.14 Stream Mitigation Weighting Factors: Threat to Stream Segment

Threat is an assessment of the level of imminent risk of loss or damage to stream ecosystems used to evaluate potential compensatory mitigation projects. This weighting factor is used only in the Stream Mitigation weighting factors analysis found in Form B. Threat is particularly relevant for stream preservation mitigation projects, with the intent of encouraging the preservation of high quality stream segments located in

areas where there is a high degree of threat to the stream ecosystem if preservation activities are not initiated. In stream restoration mitigation scenarios, the threat weighting factor should not be used unless it can be demonstrated that the mitigation proposal would counteract a threat to the stream ecosystem which would cause further degradation of the stream if the mitigation project was not pursued. Under this proposal, credits should never be awarded under this weighting factor for on-site stream relocation components of a mitigation package.

Weighting factors for the "Threat to Stream Segment" weighting factor range from 0.0 (category either not applicable or low threat) to 0.3 (very high threat). Average case weighting factor analyses were conducted using the "Moderate" threat category (WF = 0.1) for preservation and restoration projects, while for stream relocation projects, this weighting factor was deemed not applicable. Estimation of the threat to a stream segment proposed for mitigation shall be based upon any one or a combination of the following criteria:

Threat due to population growth: Based upon U.S. Census data for 1990 and 2000, Ohio counties are ranked with respect to the relative threat to stream ecosystems based upon population change (Table 6).
[Note: weighting for threat based upon population changes can also be scored using current available census data if the data presented in Table 6 is found to be antiquated].

Threat indicated by a declining water quality trend: Where valid biological data exists for a stream segment proposed for preservation credits, the stream segment would be considered to be under a **high** threat if the data indicates that the IBI or ICI for the stream segment has declined by 4 or more units, or if the MIwb for the fish community (for streams with watershed area > 20 mi^2) has declined by more than 0.5 units. A **moderate** threat is assigned for non-significant decreases in the IBI or ICI (more than 0 but less than 4 units) or the MIwb (greater than 0 but less than 0.5 units). A **low** threat would be assigned for stream segments where the IBI, ICI and MIwb scores are stable or increasing.

Threat due to construction activities: An assessment of the threat to a stream segment proposed for preservation can be made based upon the number of construction stormwater notices of intent (NOI's) submitted to the Ohio EPA in the previous 24 month period for the township in which the project is located. Areas where more than 3 construction NOI's are submitted per year are considered to be under **high** threat, and due to ste specific considerations may merit Very High Threat status. Areas where 2-3 NOI's are submitted per year would be considered to be under **moderate** threat. Areas where one or no construction stormwater NOI's have been filed per year would be considered to be under **low** threat from impacts from these activities.

Table 6. Stream threat categories based upon population growth. (Source: U.S. Census data).

County	Population from 2000 Census	Percent Change in Population from 1990 Census	Stream Threat Category	County	Population from 2000 Census	Percent Change in Population from 1990 Census	Stream Threat Category
Adams	27,330	7.7%	High	Licking	145,491	13.4%	High
Allen	108,473	-1.2%	Low	Logan	46,005	8.7%	High
Ashland	52,523	10.6%	High	Lorain	284,664	5.0%	Moderate
Ashtabula	102,728	2.9%	Moderate	Lucas	455,054	-1.6%	Low
Athens	62,223	4.5%	Moderate	Madison	40,213	8.5%	High
Auglaize	46,611	4.5%	Moderate	Mahoning	257,555	-2.7%	Low
Belmont	70,226	-1.2%	Low	Marion	66,217	3.0%	Moderate
Brown	42,285	20.9%	Very High	Medina	151,095	23.5%	Very High
Butler	332,807	14.2%	High	Meigs	23,072	0.4%	Low
Carroll	28,836	8.7%	High	Mercer	40,924	3.8%	Moderate
Champaign	38,890	8.0%	High	Miami	98,868	6.1%	Moderate
Clark	144,742	-1.9%	Low	Monroe	15,180	-2.0%	Low
Clermont	177,977	18.5%	Very High	Montgomery	559,062	-2.6%	Low
Clinton	40,543	14.5%	High	Morgan	14,897	5.0%	Moderate
Columbiana	112,075	3.5%	Moderate	Morrow	31,628	14.0%	High
Coshocton	36,655	3.5%	Moderate	Muskingum	84,585	3.1%	Moderate
Crawford	46,966	-1.9%	Low	Noble	14,058	24.0%	Very High
Cuyahoga	1,393,978	-1.3%	Low	Ottawa	40,985	2.4%	Moderate
Darke	53,309	-0.6%	Low	Paulding	20,293	-1.0%	Low
Defiance	39,500	0.4%	Low	Perry	34,078	8.0%	High
Delaware	109,989	64.3%	Very High	Pickaway	52,727	9.3%	High
Erie	79,551	3.6%	Moderate	Pike	27,695	14.2%	High
Fairfield	122,759	18.7%	Very High	Portage	152,061	6.6%	Moderate
Fayette	28,433	3.5%	Moderate	Preble	42,337	5.5%	Moderate
Franklin	1,068,978	11.2%	High	Putnam	34,726	2.7%	Moderate
Fulton	42,084	9.3%	High	Richland	128,852	2.2%	Moderate
Gallia	31,069	0.4%	Low	Ross	73,345	5.8%	Moderate
Geauga	90,895	12.0%	High	Sandusky	61,792	-0.3%	Low
Greene	147,886	8.2%	High	Scioto	79,195	-1.4%	Low
Guernsey	40,792	4.5%	Moderate	Seneca	58,683	-1.8%	Low
Hamilton	845,303	-2.4%	Low	Shelby	47,910	6.7%	Moderate
Hancock	71,295	8.8%	High	Stark	378,098	2.9%	Moderate
Hardin	31,945	2.7%	Moderate	Summit	542,899	5.4%	Moderate
Harrison	15,856	-1.4%	Low	Trumbull	225,116	-1.2%	Low
Henry	29,210	0.4%	Low	Tuscarawas	90,914	8.1%	High
Highland	40,875	14.4%	High	Union	40,909	28.0%	Very High
Hocking	28,241	10.6%	High	Van Wert	29,659	-2.6%	Low
Holmes	38,943	18.6%	Very High	Vinton	12,806	15.4%	High
Huron	59,487	5.8%	Moderate	Warren	158,383	39.0%	Very High
Jackson	32,641	8.0%	High	Washington	63,251	1.6%	Moderate
Jefferson	73,894	-8.0%	Low	Wayne	111,564	10.0%	High
Knox	54,500	14.8%	High	Williams	39,188	6.0%	Moderate
Lake	227,511	5.6%	Moderate	Wood	121,065	6.9%	Moderate
Lawrence	62,319	0.8%	Moderate	Wyandot	22,908	2.9%	Moderate
Ohio total	11,353,140	4.7%					

Imminent threat of development: On a case by case basis, stream segments under consideration as preservation sites could be considered to be under **Very High** threat if the preservation action would result in the prevention of significant loss of stream ecosystem function or geomorphic integrity resulting for activities already authorized by existing local, state, and or federal law.

5.3 "Average Case" Weighting Factor Analysis

In order to equate the new weighting factor analysis mechanisms for evaluating compensatory mitigation requirements with the old mitigation ratio approach historically imposed for impacts to stream ecosystems, the "average case" for impact and mitigation evaluations can be used. "Average case" categories and scoring for each weighting factor, as identified in Sections 5.2.1 through 5.2.14, are summarized for both impact and mitigation scenarios in Table 7. Resulting "mitigation ratios" are calculated by dividing the total adverse impact weighting factor score (Form A result) by the mitigation factor score (Form B result) resulting from each general compensatory mitigation category. Resulting "average case" mitigation ratios closely match the starting criteria desired for the process as described in Section 5.2. Allocation of secondary and tertiary benefit mitigation credits (Appendix C) was not assumed to be applicable for the "average case" scenario. Other theoretical possibilities for various other outcomes to the "mitigation ratio" calculation are quite numerous, and do not bear elaboration in this document. However, it is important to note that the power of the weighting factor approach is the allowances for reduction in the number of mitigation credits needed through pre-application design and coordination to reduce impacts either in linear footage, degree, or both, and the flexibility to design mitigation which will maximize credit allocation using Form B.

6.0 REQUIRED INFORMATION:

The following information is required for consideration of a mitigation proposal. Upon submission, proposals will be reviewed and the applicant will be advised if additional information will be required to make the proposal adequate for consideration.

- Plans and detailed information regarding the work for which the mitigation is required.
- Drawings in accordance with the requirements given in this document (see Section 9.0).
- A proposed monitoring plan and a plan for documenting baseline conditions of the mitigation site (see Section 7.0 and 7.1).
- Names, addresses, and phone numbers for all parties responsible for mitigation and monitoring.
- A description of the existing conditions of all areas to be affected by the proposed mitigation.
- A description of the existing vegetative communities to be affected by the proposed mitigation.

Table 7. Summary of "average case" impact and mitigation weighting factor scoring using Forms A and B.

Weighting Factor	Adverse Impact Weighting (Form A)	Stream Mitigation Weighting Factors (Form B)		
		Preservation	Relocation	Restoration
Existing or Resulting Aquatic Life Use	1.5 (WWH)		0.6 (WWH - all types)	
Existing or Resulting Habitat Quality	1.0 (Good)		0.5 (Good - all types)	
Priority Area	0.5 (Secondary)		0.1 (Secondary - all types)	
Existing Geomorphic Integrity	1.0 (Good)		NA - All Types	
Existing Floodplain Quality *or* Riparian/Floodplain Preservation	1.0 (Good)	0.4 (Moderate)	0.2 (Minimal)	0.4 (Moderate)
Impact Category	2.0 (Severe)		NA - All Types	
Stream Channel Restoration/ Relocation Design	NA	NA	0.5 (Minimal)	1.0 (Moderate)
Riparian Restoration and Enhancement	NA	0.2 (Minimal)	0.0 (None)	0.4 (Moderate)
Watershed Location	NA	0.3 (Within HUC 8 Digit Watershed)	1.0 (On-Site)	0.3 (Within HUC 8 Digit Watershed)
Control	NA		0.3 (Conservation Easement - all types)	
Impact/Mitigation Relationship	NA		0.5 (In-Kind - all types)	
Implementation Schedule	NA	0.2 (Schedule 2)	0.1 (Schedule 3)	0.2 (Schedule 2)
Supplemental Water Quality Activities	NA		0.0 (None - all types)	
Threat to Stream Segment	NA	0.1 (Moderate)	NA	0.1 (Moderate)
Total	7.0	3.2	3.8	4.4
"Mitigation Ratio"		2.0: 1	1.8 : 1	1.6 : 1

- When applicable, a planting plan for vegetating riparian areas (see Section 8.0).
- A narrative discussion of the key elements of the proposed mitigation plan.
- A schedule which lists all significant mitigation activities and their earliest start and latest completion dates for all of the significant activities.
- A listing of measurable success factors with quantifiable criteria for determining success.
- Definitions for all success factors and other significant terms used in the plan.
- Description of the equipment, materials, and methods required for execution of the plan (see also Section 9.0 below).
- A management plan, if necessary, for any maintenance of the mitigation.
- A contingency plan in the event that the mitigation fails to meet some or all of the success factors set in the plan (see Section 7.2).
- When necessary, a description of financial assurance mechanisms which will be utilized for the project (see Section 11.0)

7.0. MONITORING AND CONTINGENCY PLANS:

The applicant is required to monitor all stream mitigation areas for success and to provide written reports describing the findings of the monitoring efforts. For major mitigation projects, the plan should include contingency measures specifying remediation procedures which will be followed should the success criteria or scheduled performance criteria not be fully satisfied.

7.1 Monitoring Plans

Monitoring plans for stream mitigation sites are required to determine if the success criteria established within the stream mitigation plan have been met. Monitoring efforts should usually include periodic reviews in the first year and annually thereafter for a period of five (5) years. Because of the many variables involved, it is impossible to lay out the scope and types of monitoring which will be required for every possible stream mitigation scenario within this protocol. Instead, a monitoring plan should be submitted as a part of the mitigation proposal for review that includes the following general components as applicable for the specific situation:

- A narrative discussion of the key elements of the proposed monitoring and contingencies plan.
- Names of party(s) responsible for the monitoring and contingencies plan.
- A description of the baseline conditions (e.g., chemical and biological water quality, habitat quality, hydrology, soils, vegetation, and wildlife).
- A schedule for monitoring activities and reporting.
- A listing of measurable success factors with quantifiable criteria for determining success.
- Definitions for success factors and other terms used in the plan.
- Descriptions of equipment, materials, and methods to be used. This should include all field and laboratory methods which will be used to acquire data.

- Proposed protective measures for the property in question as well as a description of methods which will be used to ensure access to the mitigation area during the monitoring period (e.g., deed restrictions or conservation easements).
- Monitoring plan for stream geomorphology.
- Biological and chemical water quality monitoring plan.
- Monitoring plan for habitat for aquatic life.
- Vegetation monitoring and contingency plan.
- Hydrological monitoring and contingency plan.
- A quality assurance/quality control plan for any sampling and analysis protocols used in the monitoring plan.
- Designation of reference site(s).

Procedures used to assess mitigation sites should utilize accepted methodologies commonly used to acquire the type of data specified in the plan. In particular, all habitat and aquatic life assessment methods must use Ohio EPA protocols as described in Sections 2.1 and 2.1.2 of this document.

Monitoring reports will normally include photographic documentation, chemical and biological water quality data, data regarding survival rates of planted vegetation, and information on the monitored hydrology. Reports should also include a discussion of the pertinent success criteria with respect to the monitoring results which either confirm that they are being met or which indicate that problems have been encountered which may require remedial action. In the case of the later circumstance, a description of applicable contingency measures which have been or will be implemented should also be provided.

7.2 Contingency Plans

Section 2.h. of the Corps of Engineers Regulatory Guidance Letter (USACE, 2002) describes the general requirements for contingency plans associated with mitigation plans:

> "Compensatory mitigation plans should include contingency plans for unanticipated site conditions or changes. For example, contingency plans may identify financial assurance mechanisms that could be used to implement remedial measures to correct unexpected problems. Additionally, contingency plans will allow for modifications to performance standards if mitigation projects are meeting compensatory mitigation goals, but in unanticipated ways. Finally, contingency plans could address the circumstances that might result in no enforcement or remedial action if forces beyond the control of responsible parties adversely impact mitigation sites. ..."

The Ohio EPA will take into account all of these factors as well as the terms and conditions of the 401 Water quality Certification in determining the course of action to be taken in the event of unexpected conditions based upon the goals and objectives for

the mitigation project, the performance standards set in the plan, and the provisions of the contingency plan.

8.0. PLANTING PLAN

The stream mitigation plan must include a planting plan for projects where vegetation will be planted to stabilize disturbed areas or to enhance riparian buffer areas. All plantings should include only flora native to Ohio, and the planting plan should consider natural floristic communities characteristic of the stream setting in question. A list of native Ohio flora suitable for use with stream mitigation projects developed by the Ohio Department of Natural Resources is provided in Appendix D.

Mitigation plans which involve channel relocation or modification should be designed to leave mature riparian vegetation, especially trees, in place wherever practicable in order to maintain site stability. Prior to project construction, desirable vegetation suitable for re-planting should be salvaged so that rapid re-vegetation of disturbed areas can be facilitated.

The planting plan should include the following elements, as appropriate for the plan for mitigation:

- a table of species to be planted, including approximate numbers, spacing, types of propagules, pot sizes, etc. (both scientific and common names must be provided);
- a description of the methods to be used to establish the various plant species included in the plan including planting densities and timing (the timing of plantings should be such that fosters successful growth);
- a description of any expected volunteer native re-vegetation that is included in the site recovery expectations;
- a plan view depicting the proposed locations of planted stock and transplants;
- a narrative describing the appropriateness of the selection of plant species within the mitigation site in light of the resulting soil types and hydrologic pattern;
- a listing of the source(s) of seeds, root stock, cuttings, plant plugs, etc.;
- a description of the methods to be used for storage if plants are to be transplanted, as well as a schedule for the duration of storage;
- if temporary or permanent grass cover is to be established to stabilize the mitigation site, a description of the seed mixture to be used must be provided as well as a description of methods which will be used to remove any temporary ground cover, if required;
- a control plan that describes the strategy to recognize and control invasions of exotic or undesirable vegetation.

9.0. CONSTRUCTION PRACTICES

Construction practices at stream mitigation sites should be designed and scheduled to minimize water quality impacts with respect to the export of sediment and nutrients, and with the least impact to in-stream and riparian habitat to non-work areas. Work areas must be clearly delineated and flagged to prevent damage to non-work areas during the construction process. Staging areas and waste areas for excavated or imported materials must be protected from erosive forces to the greatest extent possible. Re-graded or exposed portions of the site should be quickly stabilized with vegetive cover following the completion of work, or if there is an anticipated delay during the construction process prior to final grading.

A storm water pollution prevention plan must be prepared for the mitigation work site whenever the plan calls for earth work. Earth work within the stream channel should be scheduled during low flow periods, and stream flows should be diverted around the work area to prevent undo erosion during construction. Best management practices for construction stormwater control should be described in the storm water pollution prevention plan, and must be installed, inspected, and maintained during construction activities. When applicable, a Notice of Intent for construction must be filed with the Ohio EPA in order to obtain coverage under the general construction stormwater NPDES permit. Applicants should consult the Ohio EPA for guidance regarding the development and implementation of this plan, as well as other requirements under this program.

Where equipment will be used within riparian areas which will be re-vegetated following the completion of construction, precautions must be taken to prevent over-compaction of soils which will hinder re-growth. Specifications for construction equipment should state that only low compression equipment ($\leq$ 6 lbs/inch^2) will be used in these sensitive areas and that any haul roads or other fill placed within the riparian buffer area will be removed, replaced with top soil consistent with site conditions, and re-vegetated following the completion of construction. Access points and work areas for construction equipment should be chosen so that equipment is used within the stream channel only when absolutely necessary and so that mature riparian vegetation and areas containing sensitive plant species are left intact to the greatest extent possible.

General work specifications for construction activities must be provided with the Section 401 Water Quality Certification application. A schedule should be provided for the development of detailed construction plans and specifications, and this information should be made available to the Ohio EPA for review upon request during the development process. Pre-construction coordination with the Ohio EPA is strongly encouraged in order to prevent problems from occurring during the implementation period.

10.0. DRAWINGS

Mitigation plans should include drawings in conformance with the following:

a. Drawings must be provided at a scale sufficient to show a level of detail adequate to review site topography and geographical features to a degree necessary to allow an adequate review of the project. Since projects are quite variable in scope, it is impossible to dictate appropriate scale for all applications. In cases where large plan sheets will be provided, duplicate copies no larger than 11 x 17" should also be provided. Generally, all drawings should have a scale no smaller than 1"=200'. Drawings must be clear, readable, and reproducible on standard, non-color office copiers. Each drawing sheet should include the following:
   - An unused margin of no less than ½".
   - An appropriate graphic scale (when reasonable).
   - All significant dimensions clearly indicated and annotated.
   - Title block with applicant's name, project title, site location, drawing date, and sheet number.
   - A directional arrow indicating north.
   - A clear, legible plan view indicating area sizes (e.g., square feet, acres) for all mitigation sites.

b. Location maps for the proposed activity must be included. Three maps must be submitted with the sites clearly delineated: a county road map, a Soil Conservation Service or Natural Resources Conservation Service county soil map which includes hydrologic features, and a U.S. Geological Service 7.5 minute quadrangle map. The location maps must show roads leading to the site and must include the name or number of these roads. The project latitude and longitude should be annotated on the maps. Each map should include a title block.

c. Plan views of the proposed mitigation must be included. These drawings must show the general and specific site location and character of all proposed activities, including the relationship of all proposed work to Waters of the State in the vicinity of the project.

d. For ground-disturbing mitigation work, cross section And longitudinal views must be submitted depicting the existing ground and channel contours and the proposed finished contours.

e. All aquatic areas within the project boundaries (avoided, impacted, or mitigated) must be shown.

f. Each restoration, enhancement, preservation, creation and upland buffer area must be shown.

g. A legend must be shown identifying cross-hatching, shading, or other marking techniques used.

h. A summary table with the quantity of each category of impact and each category of mitigation must be provided.

i. Show the ordinary high water line of affected and adjacent open surface waterbodies.

k. For mitigation plans with more than ten acres of riparian buffer area restoration or supplemental water quality projects or a combination thereof, certified topographic drawings showing the contours and elevations of the completed mitigation area may be required. The drawings should show types of plantings, locations of plantings, and all structures and work which are a significant part of the mitigation.

11.0. FINANCIAL ASSURANCES:

Financial assurances for mitigation and contingencies will generally not be required for projects with minimal and low impacts on stream ecosystems. In these cases, conditions placed within the 401 Water Quality Certification will normally be adequate to enforce the mitigation performance standards. For moderate and high impact projects, or for mitigation projects which require extensive work to implement, financial assurances should be provided that are commensurate with the level of work being proposed. Applicants are referred to the Corps of Engineers Regulatory Guidance Letter, Section 3.j (USACE, 2002), the appropriate Corps of Engineers district office, and other applicable federal guidance when developing financial assurances for stream mitigation plan development.

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APPENDIX A: GLOSSARY

APPENDIX A: GLOSSARY

Aquatic Life Use Designation: The appropriate aquatic life use designation as listed or defined in Chapter 3745-1 of the Ohio Administrative Code (OAC). Aquatic Life Use designations are either specifically listed in OAC Chapter 3745-1 or are determined for a waterbody after conducting a use attainability analysis using methodology approved by the Ohio EPA.

Armor: to rip-rap, bulkhead, or use other rigid methods to contain stream channels.

Bank or Stream Bank: the area within the flood prone width delimited by the ordinary high water mark.

Bankfull Discharge: Bankfull discharge may not be at the top of the stream bank in incised or entrenched streams. The bankfull discharge is the flow at which channel maintenance is most effective. It is the discharge that is most effective at moving sediment, forming or removing bars, forming or changing bends and meanders, and doing work that results in the average morphologic characteristics of channels (Dunne and Leopold, 1978).

Bankfull Stage: the point at which water begins to overflow onto a floodplain. As stated by Dunne and Leopold (1978): "The bankfull stage corresponds to the discharge at which channel maintenance is most effective, that is, the discharge at which moving sediment, forming or removing bars, forming or changing bends and meanders, and generally doing work that results in the average morphologic characteristics of channels."

Bankfull Width: The width of the stream channel when the water is at bankfull stage. As stated by Rosgen (1996) "... the best location to measure bankfull channel width is within the narrowest segment of the selected reach, where the channel can freely adjust its lateral boundaries under existing streamflow conditions."

Channel: the area between definite banks of a natural or artificial watercourse which confine and conduct continuously or periodically flowing water (ORC 6105.01).

Channel Dimension: The dimension of a stream is its cross sectional area (bankfull width multiplied by mean depth at bankfull discharge). Changes in bankfull channel dimensions correspond to changes in the magnitude and frequency of bankfull discharge that are associated with water diversions, reservoir regulation, vegetation conversion, development, overgrazing, and other watershed changes. Stream width is a function of occurrence and magnitude of discharge, sediment transport (including sediment size and type), and the stream bed and bank materials.

Channel Features: sequences of riffles and pools or steps and pools that maintain channel slope and stability in natural streams and provide diverse aquatic habitat.

Channelization: the altering of the course of a stream channel through stream straightening or entrenchment.

Conservation Easement: means an incorporeal right or interest in land that is held for the public purpose of retaining land, water, or wetland areas predominantly in their natural, scenic, open, or wooded condition, that imposes any limitations on the use or development of the areas that are appropriate at the time of creation of the conservation easement to achieve one or more of those purposes; and that includes appropriate provisions for the holder to enter the property subject to the easement at reasonable times to ensure compliance with its provisions.

Dominant Impact: Dominant impact is the type of impact proposed that will diminish the functional integrity of a stream.

Duration: Duration is the amount of time the adverse impacts are expected to last.

Enhanced culverts are structures that approximate the stream's width/depth ratio at bankfull discharge which minimize potential impediments to aquatic fauna movement. Enhanced culverts may have natural stream substrates or other structures within them which create resting areas for fish passage. Flood plains, if present, should be adequately culverted at an elevation equal to or greater than bankfull to pass flows.

Entrenchment Ratio: The entrenchment ratio is an index value used to describe the degree of vertical containment of a river channel. It is the ratio of the width of the flood-prone area divided by bankfull width.

Existing Physical Condition: The functional state of a stream before any pre-project/project impacts. This is a measure of the stream's natural stability and resilience relative to the physical integrity of the system exclusive of the stream's biological characteristics.

Fee Simple means that the mitigation site is owned directly by the conservation organization, park district, government agency, or other approved organization which will hold such ownership in perpetuity and which will provide protection in perpetuity for the stream channel, stream bank and approved buffer provided for in the approved mitigation plan for the site.

Fill means permanent fill of a stream channel (most often associated with stream relocation).

Flood Prone Width: The width of the flood-prone area is measured in the field at an elevation twice the maximum depth at bankfull stage. Maximum depth is the difference between the maximum cross sectional depth at bankfull stage and the thalweg elevation. The flood prone width corresponds approximately to the 50 year flood discharge elevation.

Glide: features formed under similar conditions as those which form runs, but are defined as having water depths less than 0.5 m.

Impound means to dam a stream or otherwise convert it to a lentic state. Installation of sediment control structures that modify the stream to facilitate sediment control and/or stormwater management is considered impoundment.

Linear Distance means the length of stream channel which will be affected by the proposed impact or mitigation.

Mean Depth at Bankfull: Mean depth at bankfull is the mean depth of the stream channel cross-section at bankfull stage as measured in a riffle section.

Meander: the winding or turns of a stream channel in the shape of a series of loop-like bends.

Meander Belt: the zone along a valley floor within which a stream channel meanders over time under varying flow conditions.

Meander Belt Width: the distance between lines used to define the limits of the meander of a stream channel. Several scientifically valid methods can be utilized the determine the meander belt width for a stream. For purposes of this rule, it is recommended that the meander belt width be calculated using the methods outlined in Rosgen (1986), Ward and Mecklenberg (2001), Williams (1986), or other approved methodology (see also Appendix __).

Morphologic Alteration: means to channelize, dredge, or otherwise alter the established or natural dimensions, depths, or limits of a stream corridor.

Non-profit Organization: Non-profit organization means an entity recognized and operating under the rules of the Internal Revenue Services for non-profit purposes.

Ordinary High Water Mark: means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas [33 CFR 328.3 (e)].

Pool: The pool has a flat slope and is much deeper than the average depth. Pools are located on the outside bends of meanders between riffles.

Preservation: the protection in perpetuity of ecologically important stream corridors through the implementation of appropriate legal mechanisms to prevent harm to the stream ecosystem. Preservation must include the protection of adjacent riparian buffers as necessary to ensure protection of the stream.

Reference Reach: a portion of a river segment that represents a stable channel within a particular valley morphology. The morphological data collected is used for extrapolation to disturbed or unstable reaches in similar valley types for the purposes of restoration, stream enhancement, stabilization, and stream naturalization schemes. *Modified from Rosgen (2001).*

Relocated Stream: a stream channel which is created to convey the stream flows away from the natural or existing stream channel in order to facilitate development, alter hydrologic conditions or otherwise cause a permanent abandonment of the existing stream channel from flowing water.

Road Crossing means to route a stream through pipes, box culverts, or other enclosed structures for <100 feet. This term does not include crossing the stream with a bridge.

Riffle: a streambed feature with gravel or larger size particles where the water depth is relatively shallow and the slope is steeper than the average slope of the channel. At low flows, water moves faster over riffles, which provides oxygen to the stream. Riffles are found entering and exiting meanders and control the streambed elevation.

Riparian buffer area: a vegetated transitional area between flowing water and terrestrial ecosystems, which provides a continuous exchange of nutrients and woody debris between land and water. This area is at least periodically influenced by flooding. Riparian buffer areas, if appropriately sized and managed, help to stabilize banks, limit erosion, reduce flood size flows and/ or filter and settle out runoff pollutants.

Riparian Restoration: the re-establishment of appropriately vegetated riparian buffer areas, protected in perpetuity, adjacent to a stream.

Road Crossing: to route a stream through pipes, box culverts, or other enclosed structures for <100 feet. This term does not include crossing the stream with a bridge.

Run: straight channel sections with depths greater than 0.5 m typically found below riffles where gradient and underlying substrate conditions rule out the creation of pools. The flow in runs is more laminar than that observed in riffles.

Shading and Clearing: activities, such as bridging or streambank vegetation clearing, that reduce or eliminate the quality and functions of the vegetation within the riparian habitat without disturbing the existing topography or soil stratigraphy. Although these impacts may not be directly regulated, mitigation for these impacts may be required if the impact occurs as a result of, or in association with, an activity requiring a permit.

Sinuosity: the ratio of channel length/valley length. In addition to slope, the degree of sinuosity is related to channel dimensions, sediment load, stream flow, and the bed and bank materials.

Size of Impact: Cumulative impact means the total linear feet of stream impacted by the project.

Stable Stream: A naturally stable stream channel is one that maintains its dimension, pattern, and profile over time such that the stream does not degrade or aggrade. Naturally stable streams must be able to transport the sediment load supplied by the watershed. Instability occurs when scouring causes the channel to incise (degrade) or when excessive deposition causes the channel bed to rise (aggrade).

Standard Culverts are structures of appropriate size to pass bankfull discharge but that are not specifically designed to approximate the stream's width/depth ratio at bankfull discharge or to minimize potential impacts to fish movements.

Stream: A surface watercourse having a channel (as defined in ORC 6105.01) with a well defined bed and bank, either natural or artificial, which confines and conducts continuous or periodical flowing water.

Stream Pattern: Stream pattern describes the view of a stream channel as seen from above. Streams are rarely straight; they tend to follow a sinuous path across a flood plain.

Stream Profile: The profile of a stream refers to its longitudinal slope. At the watershed scale, channel slope generally decreases in the downstream direction with commensurate increases in stream flow and decreases in sediment size. Channel slope is inversely related to sinuosity, so steep streams have low sinuosities and flat streams have high sinuosities.

Stream Relocation means moving a stream channel to a new location to allow a project, authorized under Sections 404 and 401 of the Clean Water Act and ORC Chapter 6111, to be constructed in the stream's former location.

Stream Restoration: refers to activities conducted to permanently improve in-stream habitat or geomorphology in a way which fosters a return to stable morphologic conditions and enhances the potential of the stream to meet its designated or potential aquatic life, recreational and water supply uses.

Streamway: a belt of land which includes the meander belt width and an additional width of vegetated riparian buffer equal to the minimum buffer width.

Steps: vertical drops often formed by large boulders, downed trees or bedrock outcroppings. Deep pools are typically found at the bottom of each step. Step/pool sequences are typically found in high gradient streams.

Thalweg: the path traced by the flow that follows the deepest part of the channel.

Utility crossing: open cut construction or other pipeline/utility line installation methods that require disturbance of the streambed.

Width/Depth Ratio: The width/depth ratio is an index value that indicates the shape of the channel cross-section. It is the ratio of the bankfull width divided by the mean bankfull depth.

Appendix B. Stream Mitigation Forms A-C

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name:_____Page_____ of _____

Stream Segment:_____Use Designation: _____

Impact Summary:_____

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1.** **Sum of Impact Factors (I) =**	
Enter the proposed length of stream to be impacted into Box 2.	**Box 2.** **Length of Impact (D) =**	
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3.** **Total Stream Impact Debits (I x D) =**	

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name:_____ Page: _____ of _____

Stream Segment:_____Use Designation:_____

Project Summary:_____

_____

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (use limited-see text) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	
Box 2. Mitigation Length (D) =	
Box 3. Mitigation Credits (P x D) =	

Ohio EPA 401 Water Quality Certification
Form C. STREAM IMPACT DEBIT AND MITIGATION CREDIT SUMMARY SHEET

INSTRUCTIONS: this form is for use in tallying mitigation debits and credits for projects where multiple stream segments are either impacted or proposed as mitigation sites. This form is to be completed after the completion of individual adverse impact weighting factor scoring sheets (Form A) and stream mitigation weighting factor sheets (Form B) have been completed for the proposed project. Complete the tables below using the values from the individual Form A sheets and Form B sheets in order to summarize all computed stream impact debits and stream mitigation credits proposed for the project.

Adverse Impacts (Information from Form A sheets):

Stream Segment/ Project Name	Impact Weighting Factor Score (Form A, Box 1)	Linear Feet of Impact (Form A, Box 2)	Stream Impact Debits (Form A, Box 3)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Column Totals:			

Stream Mitigation (Information from Form B or Form D sheets):

Stream Segment/ Project Name	Mitigation Weighting Factor Score (Form B, Box 1)	Linear Feet for Mitigation (Form B, Box 2)	Stream Mitigation Credits (Form B, Box 3 or Form D, Line 4)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Column Totals:			

Appendix C. Credits for Secondary and Tertiary Mitigative Benefits

Appendix C. Credits for Secondary and Tertiary Mitigative Benefits

As discussed in Sections 5.0 and 5.2.7, restoration activities conducted along a stream reach may also result in significant benefits for stream reaches upstream or downstream of the mitigation project site. Where these additional benefits can be accurately predicted, the Ohio EPA could, under this proposal grant additional mitigation credit for mitigation projects on a case-by case basis. Form D has been developed in order to facilitate the evaluation of requests to consider the awarding of additional mitigation credits. To obtain these additional credits, the applicant would have to provide sufficient biological and physical site data documentation in the mitigation proposal to justify the credit allocation. As described in the sections below, the procedure for credit allocation using Form D will divide stream segments positively affected by the proposed mitigation into three categories: the Primary Mitigative Area (Section 5.3.1), the Secondary Mitigative Area (Section 5.3.2), and the Tertiary Mitigative Area (Section 5.3.3). A graphic example of how these areas might be allocated adjacent to a hypothetical dam removal project is provided in Figure 5 and an example credit allocation scenario is presented in Section 5.2.4.

In order to qualify for stream mitigation credit, the primary mitigative area would have to be provided with sufficient riparian buffer, and be protected in perpetuity in accordance with the requirements for stream mitigation sites as outlined in other sections of this document. In addition, measures must be taken to promote stable channel geomorphology and bank stability in accordance with sound design principles as outlined in this document. Under this proposal the Ohio EPA will not grant secondary or tertiary mitigation credits for a project where it is evident that land use practices, water quality problems unrelated to the mitigation project, or other factors outside of the control of the applicant will prevent any substantive secondary or tertiary benefits from being realized from the proposed mitigation project within a reasonable period of time. In addition, the applicant would have to demonstrate that monitoring programs will be implemented for the stream segments where secondary and tertiary mitigative benefit credits are to be awarded, and that success criteria for the proposed project are established for these stream segments. Contingency plans would also be required to provide for alternative mitigation should the mitigation activity not result in the secondary or tertiary benefits predicted through the mitigation plan.

It should be emphasized that the allocation of secondary or tertiary benefit mitigation credits will not be applicable in many situations. In addition, there may be cases where only secondary or only tertiary mitigative benefit credits will be deemed applicable. Ohio EPA would also limit the application of these additional benefit credits to stream segments which meet or are found to have the potential to meet the following aquatic life use categories: Class III PHWH, WWH, EWH, and CWH. Finally, the allocation of secondary or tertiary benefit mitigation credits would only be allowed if it could be demonstrated that the areas expected to experience substantive improvement according to the criteria described below will extend past a point 300 channel feet upstream or 300 channel feet downstream of the primary mitigative area. Stream channel and biological improvements within the 300 foot proximity of the project site would be considered to be immediate influence areas for which mitigation credits are accounted for in the Form B mitigation credit allocation procedure [note: these upstream and downstream linear footages are not to be included in Box 2 “Mitigation Length” in Form B (see Section 5.3)].

C.1 Primary Mitigative Area:

The Primary Mitigative Area is the restored stream segment comprised of the mitigation project area. For dam removal projects, this area would consist of the dam pool and segments impacted by back water effects of the impoundment under low flow conditions. Low flow conditions for this review would be considered to be those at or below the median stream flow for the stream in question. Mitigation credits awarded for the primary mitigative area are calculated using Form B and the procedures outlined in Section 5 of the stream mitigation document.

C.2 Secondary Mitigative Area:

The Secondary Mitigative Area includes stream segments located greater than 300 channel feet upstream or downstream of the primary mitigative area which have a high potential for significant improvement in biological or physical integrity (habitat quality, geomorphic integrity, or both) following the implementation of the mitigation project. Significant improvement in biological integrity means that one or more of the biocriteria indices will significantly improve following the implementation of the project, or that the restorative action will facilitate migration of or open spawning areas for state or federally listed threatened or endangered species. Significant improvement for the biological community indices are considered to be +4 units or more for the IBI, +0.5 units or more for the MIwb, and + 4 or more units for the ICI . For habitat quality, significant improvement means an increase of more than 10 points in the score for the QHEI resulting directly from improvements in flow regime, bedload transport, or other stream channel functions resulting from the implementation of the restoration activity. With respect to stream channel integrity, secondary mitigative areas are those stream segments which will experience significant improvements in stream channel condition which can be documented as compared to pre-mitigation conditions and comparison to reference stream conditions obtained from stable stream reaches of the same setting and stream type. The geomorphic integrity weighting factor criteria listed in Section 5.2.4 should be used as a guide to determine whether secondary mitigative credits are appropriate based upon improvements in stream channel integrity.

As outlined in Form D, mitigation credits for secondary mitigative areas are allocated based upon the following formula:

$$C_s = L_s * M_p * 0.1$$

where: C_s = mitigation credits for the Secondary Mitigative Area

L_s = channel length of the Secondary Mitigative Area, and

M_p = sum of mitigation factor values for the Primary Mitigative Area as calculated in Box 1 of Form B

C.3 Tertiary Mitigative Area:

Tertiary Mitigative Areas are those stream segments which have only a moderate potential for improvement in biological or physical integrity or habitat quality following the removal of the impoundment structure. Biological community indices in tertiary mitigative areas will not improve significantly (<4 units for the IBI, <0.5 units for the MIwb, and <4 units for the ICI), but the applicant can demonstrate that the restorative action will facilitate migration of or open spawning areas for native aquatic fauna which were previously excluded. For habitat quality, improvement in the QHEI scoring will be realized, but the anticipated improvements resulting directly from the project will be < 10 points. In order to be considered as a tertiary mitigative area it would have to be evident based upon site-specific information that instability factors caused by the conditions being addressed in the stream restoration project are contributing to the degradation of stream integrity (upstream or downstream), and that this condition will continue or worsen unless mitigative intervention is taken.

As outlined in Form D, mitigation credits for tertiary mitigative areas are allocated based upon the following formula:

$$C_t = L_t * M_p * 0.05$$

where: C_t = mitigation credits for the Secondary Mitigative Area

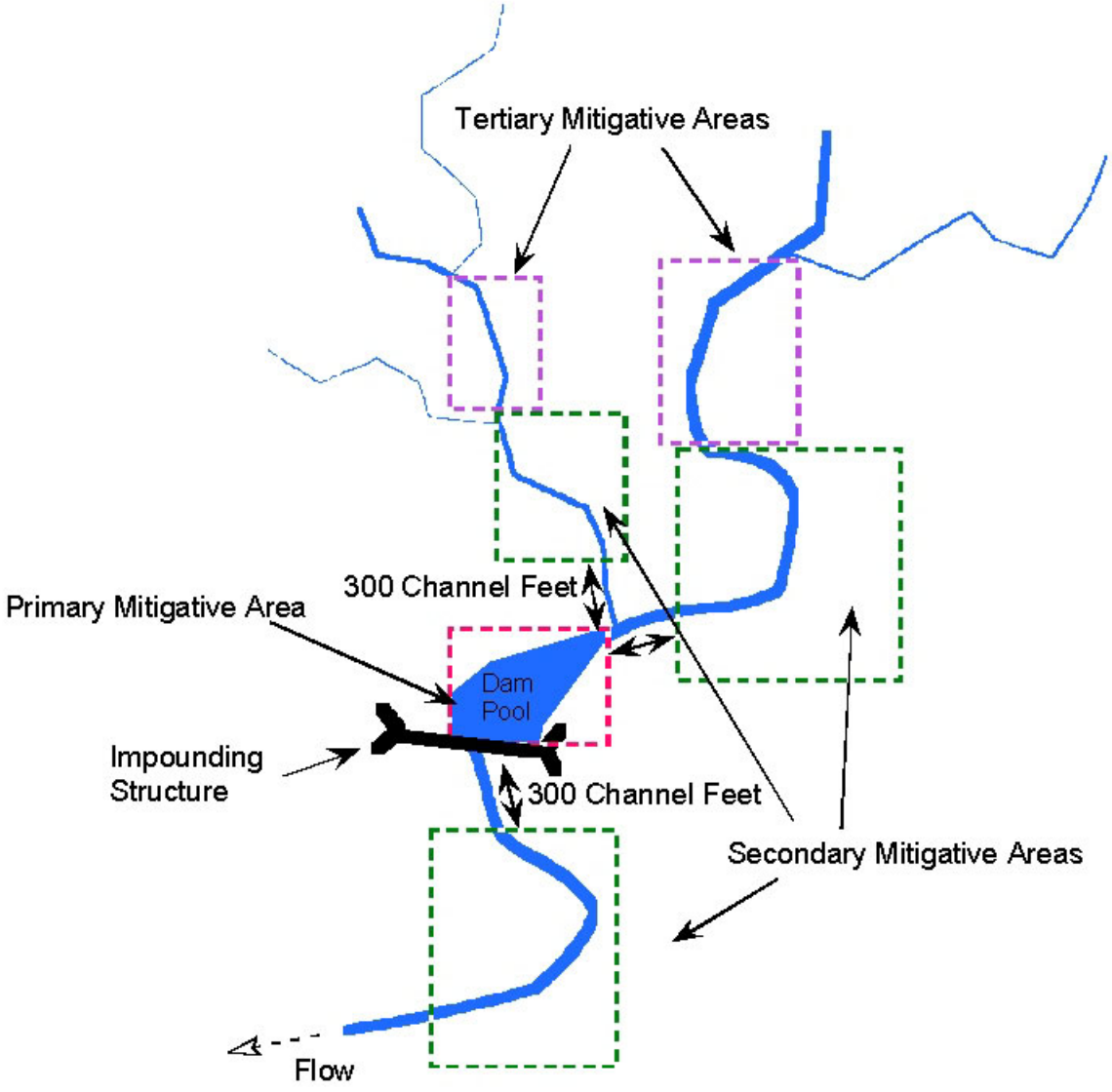
L_t = channel length of the Secondary Mitigative Area, and

M_p = sum of mitigation factor values for the Primary Mitigative Area as calculated in Box 1 of Form B

C.4 Example for Allocation of Secondary and Tertiary Benefit Mitigation Credits

A hypothetical situation involving the removal of a dam as depicted in Figure C.1 will be used in order to illustrate how the allocation of mitigation credits for secondary and tertiary mitigative benefits would work in relation to a stream mitigation project. For this scenario, the project would include removal of the dam structure and supporting foundational structures, stabilization of stream banks, and provision of in-channel and floodplain modifications which will allow the stream to recover to naturalized, referenced conditions. The stream in question is a WWH stream for which a TMDL has identified impairments to fish migration and dissolved oxygen violations resulting from the impoundment of the stream as factors causing non-attainment. Removal of the dam structure will directly affect 750 linear feet of dam pool and backwater area which will be protected through the donation of the property to a park district via fee simple ownership. Based upon an evaluation of the project using the protocol in Form B, the Sum of Factor Values for mitigation of the primary mitigative area equals 4.9, with a total mitigation credit allocation of 3,675 mitigation credits (750 * 4.9).

Figure C.1. Hypothetical dam removal example indicating potential designation of secondary and tertiary mitigative areas for credit allocation (See Section 5.3.4 for example credit allocation summary).



Analysis of existing data and stream measurements taken in conjunction with the project have identified two upstream reaches totaling 1,650 linear feet which have a very high probability of significant improvement in IBI and MIWB scores, and which will serve as spawning habitat for a state threatened fish species. In addition, analysis of data for a downstream segment of the impounded stream segment totaling 1,150 feet indicates that re-establishment of natural bedload transport following the removal of the dam has a high probability of improving QHEI scores by 10 points or more, and of providing habitat for two state threatened mussel species which are currently found only in the upper reaches of the watershed. The analysis using Form D would allocate 1,372 secondary mitigative benefit credits under this scenario:

$$1{,}372 = [(1{,}650 + 1{,}150) * 4.9 * 0.1]$$
$$C_s = L_s * M_p * 0.1 \quad \text{(Section C.2).}$$

Analysis of existing data and stream measurements taken in conjunction with the project have identified two upstream reaches totaling 1,650 linear feet which have a very high probability of significant improvement in IBI and MIWB scores, and which will serve as spawning habitat for a state threatened fish species. In addition, analysis of data for a downstream segment of the impounded stream segment totaling 1,150 feet indicates that re-establishment of natural bedload transport following the removal of the dam has a high probability of improving QHEI scores by 10 points or more, and of providing habitat for two state threatened mussel species which are currently found only in the upper reaches of the watershed. The analysis using Form D would allocate 1,372 secondary mitigative benefit credits under this scenario:

$$1{,}372 = [(1{,}650 + 1{,}150) * 4.9 * 0.1]$$
$$C_s = L_s * M_p * 0.1 \quad \text{(Section C.2).}$$

The stream data collected in conjunction with the project also justify categorization of two upstream segments, totaling 1,400 linear feet, as tertiary mitigative areas since re-naturalization of flooding regimes will alleviate habitat degradation documented in these stream segments, and since the data indicates that re-connection of these segments to migration for several fish species will open additional suitable spawning habitat which is currently unavailable. The analysis using Form D would allocate 343 tertiary mitigative benefit credits under this scenario:

$$343 = (1{,}400 * 4.9 * 0.05)$$
$$C_t = L_t * M_p * 0.05 \quad \text{(Section C.3).}$$

The total mitigation credits allocated for this hypothetical project therefore equals 5,390, of which 32% are achieved through secondary and tertiary mitigative benefit analysis using Form D.

Ohio EPA 401 Water Quality Certification
Form D. SECONDARY AND TERTIARY MITIGATIVE BENEFITS WORKSHEET

Project Name:_____ Page: _____ of _____

Primary Mitigation Segment:_____

Sum of Mitigation Weighting Factors for Primary Mitigation Area (Form B, Box 1):_____

Project Summary (attach additional sheets as necessary):_____

_____

INSTRUCTIONS: provide a brief summary of information for each stream segment for which secondary or tertiary mitigation credits are requested. Identify each segment using a short descriptor in the left hand column. Under the "reference" column, provide the section number for the appropriate report where the justification and data supporting the listing can be found. Under the basis for listing, one or more of the following categories should be entered: "Aquatic Life", "Habitat", "Geomorphic Integrity", or "Endangered or Threatened Species" (see text for criteria).

Secondary Benefit Segments:

Secondary Benefit Segment ID	Reference	Basis for Listing	Linear Feet
1.			
2.			
3.			
4.			
5.			

Total Footage for Secondary Benefit L_s: _____

Tertiary Benefit Segments:

Secondary Benefit Segment ID	Justification	Data Reference	Linear Feet
1.			
2.			
3.			
4.			
5.			

Total Footage for Tertiary Benefit L_t: _____

Additional Credit Calculation:

1. Primary Mitigation Credits C_p (Form B, Box 3): _____
2. Secondary Mitigation Credits C_s: $C_s = L_s * M_p * 0.1$ _____
3. Tertiary Mitigation Credits C_t: $M_t = L_t * M_p * 0.01$ _____
4. Total Mitigation credits for Project (sum of lines 1-3): _____

Appendix D. Native Riparian Plant Species Recommended for Stream Restoration Projects in Ohio.

Appendix D. Native Riparian Plant Species Recommended for Stream Restoration Projects in Ohio.
(Table currently being updated by ODNR-will be updated prior to public distribution)

	Floodplains	Stream Banks (Bankfull to Low Water)	Bars, High Flow Channels, Islands, Low Water	Distribution
American sycamore (*Platanus occidentalis)* +	X	X	X	Statewide
river birch (*Betula nigra)* +	X	X	X	Unglaciated/Southeastern streams
eastern cottonwood (*Populus deltoids)* +	X	X	X	Low gradient, wetland streams
silver maple – (*Acer saccharinum)* +	X	X	X	Statewide
red maple - *Acer rubrum* +				
green ash - *Fraxinus pennsylvanica* +				
box elder - *Acer negundo* +				
alder?				
black walnut - *Juglans nigra* +				
hackberry - *Celtis occidentalis*				
american elm - *Ulmus americana* +				
pawpaw - *Asimina triloba* +				
black willow - *Salix nigra* +				
large willow tree species?				
Sandbar willow - *Salix exigua*+				
swamp white oak - *Quercus bicolor* +				
pin oak - *Quercus palustris* +				
white oak - *Quercus alba*				
Tuliptree - *Liriodendron tulipifera*+				
American beech - *Fagus grandifolia*				
black cherry - *Prunus serotina*+				
Eastern hemlock				
Water-willow				
Horse-tail				
Pickerel weed				
Lizard's tail				
Slippery Elm - *Ulmus rubra* +				
Ohio Buckeye - *Aesculus glabra*				
Yellow Buckeye - *Aesculus octandra*				
Honey Locust - *Gleditsia triacanthos* +				
Black Locust - *Robinia pseudoacacia*				
Red Osier Dogwood - *Cornus sericea* +				
Silky Dogwood - *Cornus amomum* +				
Red Chokeberry - *Aronia arbutifolia* +				

Black Chokeberry - *Aronia melanocarpa* +
Common Winterberry - *Ilex verticillata*+
Bush Cinquefoil - *Potentilla fruticosa* +
American Elderberry - *Sambucus canadensis* +
Witherod Viburnum - *Viburnum cassinoides* +
Virginia Creeper - *Parthenocissus quinquefolia* +
American Hornbeam - *Carpinus caroliniana*
Common Buttonbush - *Cephalanthus occidentalis* +
Common Ninebark - *Physocarpus opulifolius* +
Large grape vine

Appendix E. Case Studies

Stream Mitigation Case Study #1

Cleveland Hopkins Airport Expansion

Proposal to culvert 5,400 linear feet of Abram Creek, a WWH stream tributary to the Rocky River to facilitate runway expansion.
Stream in non-attainment for biological indices. Habitat scores and stream channel integrity variable throughout impact reach. Impact assessment split to reflect a 2,400 foot poor quality section in the vicinity of the airport runways and a 3,000 linear foot high quality stream channel downstream of the runways.
In addition, the project included filling of 2,500 linear feet of intermittent undesignated stream channel with the diversion of flows.

Mitigation includes:

- Restoration of 1,500 feet of Woodiebrook, a heavily impacted tributary to the Chagrin River which provided habitat for a population of native Ohio Brook Trout (State Threatened).
- Preservation of 4,700 feet of Spring Brook, an unimpacted tributary to the Chagrin River which provided habitat for a population of native Ohio Brook Trout (State Threatened). This stream segment was threatened by development plans.
- Enhancement of 12,000 of Doan Brook, a direct Lake Erie tributary. This stream has been heavily impacted by channel modifications due to urban development.
- Enhancement of approximately 1,500 feet of the West Fork West Branch Black River. This segment has been impacted by downcutting caused by channel straightening associated with highway construction.
- Preservation of 3,000 feet of Elk Creek, tributary to the West Branch Black River.

Comparison Table:

(Note: the mitigation requirements for this project were set through Director's Findings and Orders and a 401 Waiver, not through the 401 process)

	Linear Feet	Impact or Mitigation Category	Impact Debits or Mitigation Credits
Impacts:			
Abram Creek	2,400	Culvert	13,920
Abram Creek	3,000	Culvert	22,500
UT Abram Creek	2,500	Fill	7,500
Total	7,900		43,920

	Linear Feet	Impact or Mitigation Category	Impact Debits or Mitigation Credits
Mitigation:			
Woodiebrook	1,500	Restoration	12,150
Spring Brook	4,707	Preservation	20,240
Doan Brook	12,000	Restoration	39,600
West Fork E. Branch Black R.	1,500	Restoration	8,850
Elk Creek	3,000	Preservation	12,000
Total	22,707		92,840
Mitigation : Impact Ratio	2.9 : 1		2.1: 1

Analysis:

This case is unique in that it was not resolved through the traditional 401 Water Quality Certification process. Rather, the Ohio EPA waived it's 401 review and resolved stream mitigation requirments through a consensual administrative order with the applicant. Therefore, direct comparison of mitigation requirements and impacts has little carry over to other projects. This case study was included because of the diversity in the types of stream mitigation which were employed in order to demonstrate outcomes for various approaches to stream mitigation.

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Cleveland Hokins International Airport Page 1 of 8

Stream Segment: Abram Creek, Grayton Rd. to end of runway Use Designation: WWH

Impact Summary: Culvert stream for runway expansion

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	1.5
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	0.6
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		1.0
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	0.5
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	0.2
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	2.0

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1.** **Sum of Impact Factors (I) =**	5.8
Enter the proposed length of stream to be impacted into Box 2.	**Box 2.** **Length of Impact (D) =**	2,400
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3.** **Total Stream Impact Debits (I x D) =**	13,920

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Cleveland Hokins International Airport Page 2 of 8

Stream Segment: Abram Creek, end of runway to Cedar Pt. Rd. Use Designation: WWH

Impact Summary: Culvert stream for runway expansion

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	1.5
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	1.0
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		1.0
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	1.0
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	1.0
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	2.0

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.

Box 1. Sum of Impact Factors (I) = 7.5

Enter the proposed length of stream to be impacted into Box 2.

Box 2. Length of Impact (D) = 3,000

Multiply the values of Box 1 and Box 2 and enter the result in Box 3.

The value of Box 3 equals the total number of stream impact debits for the assessed impacts.

Box 3. Total Stream Impact Debits (I x D) = 22,500

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Cleveland Hokins International Airport Page 3 of 8

Stream Segment: Unnamed Trib. Abram Creek (NASA trib.) Use Designation: Class II PHWH

Impact Summary: Fill in stream channel, divert flow

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	3.0
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1.** **Sum of Impact Factors (I) =**	3.0
Enter the proposed length of stream to be impacted into Box 2.	**Box 2.** **Length of Impact (D) =**	2,500
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3.** **Total Stream Impact Debits (I x D) =**	7,500

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Cleveland Hopkins Airport Expansion Page: 4 of 8

Stream Segment: Woodiebrook - Geauga Co. Use Designation: CWH

Project Summary: Restoration of native brook trout stream

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	3.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.7
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.7
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	1.0
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	1.0
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.5
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	0.0
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.5
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.1
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.3
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.3

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	8.1
Box 2. Mitigation Length (D) =	1,500
Box 3. Mitigation Credits (P x D) =	12,150

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Cleveland Hopkins Airport Expansion Page: 5 of 8

Stream Segment: Spring Brook - Geauga Co. Use Designation: CWH

Project Summary: Preservation of native brook trout stream

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	0.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.7
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	1.0
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	1.0
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.5
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	0.0
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.5
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.1
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.3
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.2

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	4.3
Box 2. Mitigation Length (D) =	4,707
Box 3. Mitigation Credits (P x D) =	20,240

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Cleveland Hopkins Airport Expansion Page: 6 of 8

Stream Segment: Doan Brook - Cuyahoga Co. Use Designation: WWH

Project Summary: Restoration of urban stream

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	1.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.2
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.6
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	0.1
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.5
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	0.0
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.5
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	-0.1
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.0

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	3.3
Box 2. Mitigation Length (D) =	12,000
Box 3. Mitigation Credits (P x D) =	39,600

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Cleveland Hopkins Airport Expansion Page: 7 of 8

Stream Segment: West Fork East Branch Black River Use Designation: WWH

Project Summary: Enhancement of stream channel and stream banks

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	2.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.7
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.4
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.6
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	0.5
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.1
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	0.3
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.5
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.2
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.1

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	5.9
Box 2. Mitigation Length (D) =	1,500
Box 3. Mitigation Credits (P x D) =	8,850

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Cleveland Hopkins Airport Expansion Page: 8 of 8

Stream Segment: Elk Creek Use Designation: WWH

Project Summary: Preservation of stream corridor

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	0.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.7
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.4
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**	WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**		0.6
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**	Good **0.5**	Excellent **1.0**			0.5
Priority Area (Section 5.2.3)	Tertiary **0.0**	Secondary **0.1**	Primary **0.5**			0.1
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	0.3
Control (Section 5.2.10)	Deed Restriction **0.0**	Conservation Easement **0.3**	Fee Simple **0.5**			0.5
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**	In-Kind **0.5**				0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.3
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**	Excellent **0.3**		0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**	Very High **0.3**		0.1

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	4.0
Box 2. Mitigation Length (D) =	3,000
Box 3. Mitigation Credits (P x D) =	12,000

Ohio EPA 401 Water Quality Certification
Form C. STREAM IMPACT DEBIT AND MITIGATION CREDIT SUMMARY SHEET

Project Name: Cleveland Hopkins Airport expansion Page: 1 of 1

INSTRUCTIONS: this form is for use in tallying mitigation debits and credits for projects where multiple stream segments are either impacted or proposed as mitigation sites. This form is to be completed after the completion of individual adverse impact weighting factor scoring sheets (Form A) and stream mitigation weighting factor sheets (Form B) have been completed for the proposed project. Complete the tables below using the values from the individual Form A sheets and Form B sheets in order to summarize all computed stream impact debits and stream mitigation credits proposed for the project.

Adverse Impacts (Information from Form A sheets):

Stream Segment/ Project Name	Impact Weighting Factor Score (Form A, Box 1)	Linear Feet of Impact (Form A, Box 2)	Stream Impact Debits (Form A, Box 3)
1. Abram Creek, Grayton Rd. to end of runway	5.8	2,400	13,920
2. Abram Creek, end of runway to Cedar Pt. Rd.	7.5	3,000	22,500
3. Unnamed trib. to Abram Creek (NASA trib.)	3.0	2,500	7,500
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Column Totals:		7,900	43,920

Stream Mitigation (Information from Form B or Form D sheets):

Stream Segment/ Project Name	Mitigation Weighting Factor Score (Form B, Box 1)	Linear Feet for Mitigation (Form B, Box 2)	Stream Mitigation Credits (Form B, Box 3 or Form D, Line 4)
1. Woodiebrook	8.1	1,500	12,150
2. Spring Brook	4.3	4,707	20,240
3. Doan Brook	3.3	12,000	39,600
4. West Fork East Branch Black River	5.9	1,500	8,850
5. Elk Creek	4.0	3,000	12,000
6.			
7.			
8.			
9.			
10.			
Column Totals:		22,707	92,840

Stream Mitigation Case Study # 2

Buckeye Industrial Mining #1435

In order to facilitate the surface mining of an area approximately 136 acres in size, the applicant proposed to temporarily divert 640' of intermittent stream, mine through the stream channel and then reconstruct the stream channel as part of the site restoration plan. The resulting stream channel would again be 640' long, but would now be above any groundwater outflow, and thus would become an ephemeral stream. The new stream channel would be rock lined to prevent erosion, and the riparian would be seeded with perennial grasses to ultimately support livestock grazing. No additional mitigation was proposed.

Comparison Table:

	Linear Feet	Impact or Mitigation Category	Impact Debits or Mitigation Credits
Impacts:			
UT to Still Fork Sandy Creek	640	Mining	1,920
Total	640		1,920
Mitigation:			
Reconstruct stream channel	640	Reconstruction	1344
Total	640		1344
Mitigation : Impact Ratio	1:1		0.7: 1

Analysis:

The proposal presented in the application would not be acceptable because the mitigation credits do not equal or exceed those calculated as necessary for the project. In addition, the project would not meet the minimal requirements for the provision of appropriate vegetated riparian buffer following stream channel reconstruction. Additional mitigation credits could be achieved for the project through the development of better plans for stream channel reconstruction and the provision of appropriate riparian buffer which would negate any need for off-site mitigation in this case.

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Buckeye Industrial Mining #1435 Page 1 of 2

Stream Segment: Unnamed tributary to the Still Fork Sandy Creek Use Designation: Class II PHWH

Impact Summary: Mining and relocation of a Class II PHWH stream

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	3.0
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1. Sum of Impact Factors (I) =**	3.0
Enter the proposed length of stream to be impacted into Box 2.	**Box 2. Length of Impact (D) =**	640
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3. Total Stream Impact Debits (I x D) =**	1,920

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Buckeye Industrial Mining #1435 Page: 2 of 2

Stream Segment: Unnamed tributary to the Still Fork Sandy Creek Use Designation: Class II PHWH

Project Summary: Relocation of stream following surface coal mining

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	(Minimal (Relocation Projects Only) **0.5**)	Moderate **1.0**	Good **2.0**	Excellent **3.0**	0.5
Riparian/ Floodplain Preservation (Section 5.2.5)	(Minimal (Relocation Projects Only) **0.0**)	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Riparian Restoration and Enhancement (Section 5.2.8)	(None **0.0**)	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Resulting Aquatic Life Use (Section 5.2.1)	(MWH or Class II PHWH **0.1**)		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.1
Resulting Habitat Quality (Section 5.2.2)	(Fair (Relocation Projects Only) **0.1**)		Good **0.5**		Excellent **1.0**	0.1
Priority Area (Section 5.2.3)	(Tertiary **0.0**)		Secondary **0.1**		Primary **0.5**	0.0
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	(Onsite **1.0**)	1.0
Control (Section 5.2.10)	(Deed Restriction **0.0**)		Conservation Easement **0.3**		Fee Simple **0.5**	0.0
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			(In-Kind **0.5**)		0.5
Implementation Schedule (Section 5.2.12)	(Schedule 5 **-0.1**)	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	-0.1
Supplemental Water Quality Activities (Section 5.2.13)	(None **0.0**)	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	(NA or Low **0.0**)	Moderate **0.1**	High **0.2**		Very High **0.3**	0.0

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	2.1
Box 2. Mitigation Length (D) =	640
Box 3. Mitigation Credits (P x D) =	1,344

Stream Mitigation Case Study # 3

Kent State Wellness Center

To facilitate the construction of a new recreational facility on campus, KSU relocated approximately 1,200 linear feet of a modified undesignated perennial stream, creating a 700 foot channel. Design of the new channel was highly engineered, although a low flow channel was created. Riparian buffer of approximately 50 ft per bank was established.

This certification was issued after the fact in conjunction with Director's Findings and Orders.

Comparison Table:

	Linear Feet	Impact or Mitigation Category	Impact Debits or Mitigation Credits
Impacts:			
UT to Breakneck Creek	1,200	Fill and Relocation	3,600
Total	1,200		3,600
Mitigation:			
Reconstruct stream channel	700	Reconstruction	1,750
Total	700		1,750
Mitigation : Impact Ratio	0.6 : 1		0.5: 1

Analysis:

The proposal presented in the application would not be acceptable because the mitigation credits do not equal or exceed those calculated as necessary for the project. Additional mitigation credits could be achieved for the project through the development of better plans for stream channel reconstruction and the provision of better riparian buffer, riparian enhancement, or supplemental water quality improvements. If these options were not available on-site, additional off-site mitigation might be required in this case. Since this project proceeded without prior authorization, additional mitigation could have been required as part of the enforcement action which resolved the case.

Since the proposed impacts involved a PHWH stream, the applicant could have opted to use the General High Quality Water (warmwater habitat) alternative for calculating the credits need for mitigation using Form A. In this case, the analysis would have resulted in a total debit weighting factor of 4.9 for Box 1 of Form A and a total number of stream debits of 5,880 for the project.

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Kent State Wellness Center Page 1 of 2

Stream Segment: Unnamed tributary to Breakneck Creek Use Designation: Class II PHWH

Impact Summary: Relocate stream to facilitate construction project

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	3.0
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1. Sum of Impact Factors (I) =**	3.0
Enter the proposed length of stream to be impacted into Box 2.	**Box 2. Length of Impact (D) =**	1,200
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3. Total Stream Impact Debits (I x D) =**	3,600

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Kent State Wellness Center Page: 2 of 2

Stream Segment: Unnamed tributary to Breakneck Creek Use Designation: Class II PHWH

Project Summary: Relocation of stream to facilitate construction project

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	0.5
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.4
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.1
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	0.1
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.0
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	1.0
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.0
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	-0.1
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.0

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	2.5
Box 2. Mitigation Length (D) =	700
Box 3. Mitigation Credits (P x D) =	1,750

Stream Mitigation Case Study # 4

Boston Mills Rd. Residential Development

In order to facilitate the construction of a residential sub-division, the applicant proposed culverting approximately 830 linear feet of intermittent stream (an unnamed tributary to Brandywine Creek). Mitigation offered for the project was the preservation of 845 linear feet of the same stream downstream of the project site. Preservation of a forested riparian corridor of approximately 100 feet in width on either side of the stream was proposed.

Comparison Table:

	Linear Feet	**Impact or Mitigation Category**	**Impact Debits or Mitigation Credits**
Impacts:			
UT to Brandywine Creek	830	Culvert	2,490
Total	830		2,490
Mitigation:			
Reconstruct stream channel	845	Preservation	2,451
Total	845		2,451
Mitigation : Impact Ratio	1:1		1.0 : 1

Analysis:

The preservation proposal presented in the application provided more than the necessary mitigation credits needed. However, since the impact exceeded 500 linear feet of stream, under the current concept document, 30% or 747 of the necessary mitigation credits would be required to involve stream restoration activities. Therefore, additional on-site or off-site mitigation would be required to satisfy the mitigation requirements for this project. The applicant would have a range of options to modify their proposal to meet their stream mitigation requirements. This would include altering the proposed project to reduce the impact to less than 500 linear feet (which would also reduce the total number of mitigation credits needed), or to propose on or off-site stream restoration or enhancement activities to meet the 30% stream restoration requirements. Avoidance or minimization options for the stream which do not involve culverting could also be considered in order to reduce or eliminate the requirements for stream mitigation.

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Boston Mills Rd. Residential Development Page 1 of 2

Stream Segment: Unnamed tributary to Brandywine Creek Use Designation: Class II PHWH

Impact Summary: Culvert stream for residential development

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	3.0
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1. Sum of Impact Factors (I) =**	3.0
Enter the proposed length of stream to be impacted into Box 2.	**Box 2. Length of Impact (D) =**	830
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3. Total Stream Impact Debits (I x D) =**	1,660

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Boston Mills Rd. Residential Development Page: 2 of 2

Stream Segment: Unnamed tributary to Brandywine Creek Use Designation: Class II PHWH

Project Summary: Preservation of stream corridor downstream od impacted segment

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	0.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.7
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.1
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	0.5
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.0
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	0.8
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.0
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.2
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.1

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	2.9
Box 2. Mitigation Length (D) =	845
Box 3. Mitigation Credits (P x D) =	2,451

Stream Mitigation Case Study # 5

Whitlatch Development, Twinsburg

Approximately 1,000 linear feet of Tinkers Creek were relocated in order to facilitate the construction of a commercial development. A new 1,000 foot "bio-engineered" channel was constructed on-site. Design of the new channel was established using the reference reach approach, although many of the designed channel features turned out to be above the predominant water depth and are only functional at high flows. The utility of these structures as habitat features in the stream is minimal. The design also called for the establishment of forested riparian buffer of approximately 25 feet per bank. The mitigation proposal also included the preservation of approximately 1,500 linear feet of stream upstream of the project site (34 acres total). The width of the preserved riparian varies, but generally ranges from 100-200 feet of forested riparian per bank.

This project was initially denied a 401 Water Quality Certification. Mitigation requirements were set in consensual administrative orders which resolved the applicant's appeal.

Comparison Table:

	Linear Feet	**Impact or Mitigation Category**	**Impact Debits or Mitigation Credits**
Impacts:			
Tinkers Creek	1,000	Relocation	7,300
Total	1,000		7,300
Mitigation:			
Reconstruct stream channel	1,000	Relocation	5,900
Preservation upstream	1,500	Preservation	7,350
Total	2,500		13,250
Mitigation : Impact Ratio	2.5 : 1		1.8 : 1

Analysis:

The stream mitigation projects implemented by the applicant for this project exceed those which would be required under the concept document protocol. It is noted that neither the stream relocation project nor the stream preservation could individually provide the required mitigation for the impacts to the stream resulting from the project.

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Whitlatch Commercial Development Page 1 of 3

Stream Segment: Tinkers Creek Use Designation: WWH

Impact Summary: Relocation of stream for a commercial development

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	1.5
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	1.0
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		1.0
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	1.0
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	1.0
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	2.0

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1.** **Sum of Impact Factors (I) =**	7.5
Enter the proposed length of stream to be impacted into Box 2.	**Box 2.** **Length of Impact (D) =**	1,000
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3.** **Total Stream Impact Debits (I x D) =**	7,500

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Whitlatch Commercial Development Page: 2 of 3

Stream Segment: Tinkers Creek Use Designation: WWH

Project Summary: Relocation of stream for a commercial development project

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	2.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.4
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.6
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	0.5
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.5
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	1.0
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.3
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.1
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.0

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	5.9
Box 2. Mitigation Length (D) =	1,000
Box 3. Mitigation Credits (P x D) =	5,900

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Whitlatch Commercial Development Page: 3 of 3

Stream Segment: Tinkers Creek Use Designation: WWH

Project Summary: Preservation of stream corridor upstream of impact

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	1.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.4
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.6
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	0.5
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.5
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	1.0
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.3
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.1
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.0

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	4.9
Box 2. Mitigation Length (D) =	1,500
Box 3. Mitigation Credits (P x D) =	7,350

Ohio EPA 401 Water Quality Certification
Form C. STREAM IMPACT DEBIT AND MITIGATION CREDIT SUMMARY SHEET

Project Name: Whitlatch Commercial Development Page: 1 of 1

INSTRUCTIONS: this form is for use in tallying mitigation debits and credits for projects where multiple stream segments are either impacted or proposed as mitigation sites. This form is to be completed after the completion of individual adverse impact weighting factor scoring sheets (Form A) and stream mitigation weighting factor sheets (Form B) have been completed for the proposed project. Complete the tables below using the values from the individual Form A sheets and Form B sheets in order to summarize all computed stream impact debits and stream mitigation credits proposed for the project.

Adverse Impacts (Information from Form A sheets):

Stream Segment/ Project Name	Impact Weighting Factor Score (Form A, Box 1)	Linear Feet of Impact (Form A, Box 2)	Stream Impact Debits (Form A, Box 3)
1. Relocate Tinkers Creek for commercial development	7.5	1,000	7,500
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Column Totals:		1,000	7,500

Stream Mitigation (Information from Form B or Form D sheets):

Stream Segment/ Project Name	Mitigation Weighting Factor Score (Form B, Box 1)	Linear Feet for Mitigation (Form B, Box 2)	Stream Mitigation Credits (Form B, Box 3 or Form D, Line 4)
1. Tinkers Creek relocation	5.9	1,000	5,900
2. Upstream preservation along Tinkers Creek	4.9	1,500	7,350
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Column Totals:		2,500	13,250

Stream Mitigation Case Study # 6

Myers Mining (D-2014)

In conjunction with coal mining activities, the applicant proposed to relocate three stream segments. They included 700 linear feet of Long Creek (WWH), 1,310 linear feet of intermittent stream (Class II PHWH), and 197 feet of ephemeral stream (Class I PHWH). The mitigation proposal consisted of reconstructing the stream channels using reference reach conditions and the provision of 50 feet of forested riparian buffer per bank of the relocated streams.

Comparison Table:

	Linear Feet	**Impact or Mitigation Category**	**Impact Debits or Mitigation Credits**
Impacts:			
Long Creek (WWH)	700	Relocation/ Reconstruction	4,200
Trib D - intermittent (Class II PHWH)	1,310	Relocation/ Reconstruction	3,930
Stream E - ephmeral (Class I PHWH	197	Relocation/ Reconstruction	NA
Total	2,207		8,130
Mitigation:			
Reconstruct stream channel (WWH)	700	Relocation	4,200
Reconstruct stream channel (Class II PHWH)	1,310	Relocation	4,192
Reconstruct stream channel (Class I PHWH)	197	Relocation	NA
Total	2,207		8,392
Mitigation : Impact Ratio	1:1		1.0 : 1

Analysis:

Mitigation requirements for the Class II PHWH (intermittent) stream channel are based upon use of the default impact factor of 3.0, which simplifies the analysis using Form A. However, the full analysis is used to score the mitigation proposed for the impact to this stream, resulting in the assignment of more mitigation credits in Form B than were calculated in the impact assessment (4,192 mitigation credits vs. 3,930 impact debits). The reason for this difference is that the applicant proposed the establishment of 50 feet of forested riparian buffer along the reconstructed stream channel rather than providing only minimal riparian buffer. The riparian enhancement metric also scored higher than the minimum scoring in Form B since much of the floodplain prior to impact was grazing pasture, and this area will be converted to forested riparian following the mining impact. The proposal for on-site mitigation, the use of sound channel design practices and the establishment of a beneficial riparian buffer along the stream channels resulted in an overall mitigation plan which more than compensated for the proposed impacts as calculated using the proposed procedures.

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Myers Mining (D-2014) Page 1 of 4

Stream Segment: Long Creek Use Designation: WWH

Impact Summary: Impound stream and relocate to facilitate surface coal mining

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	1.5
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	0.6
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		0.1
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	1.0
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	0.8
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	2.0

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1.** **Sum of Impact Factors (I) =**	6.0
Enter the proposed length of stream to be impacted into Box 2.	**Box 2.** **Length of Impact (D) =**	700
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3.** **Total Stream Impact Debits (I x D) =**	4,200

Ohio EPA 401 Water Quality Certification
FORM A. ADVERSE IMPACT WEIGHTING TABLE FOR STREAM IMPACTS

Project Name: Myers Mining (D-2014) Page 2 of 4

Stream Segment: Intermittent tributary to Long Creek Use Designation: Class II PHWH

Impact Summary: Relocate stream to facilitate surface coal mining

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Impact Factors	Options						Impact Factor Value
Existing Aquatic Life Use **Section 5.2.1**	LRW Class I PHWH Protection of Downstream Uses, skip remaining analysis	MWH Class II PHWH Enter **3.0** for (I) in Box 1 below, calculate mitigation credits needed	WWH **1.5**	EWH **2.5**	CWH Class III PHWH **3.0**	SSH Add **0.2** to score for June-September Aquatic life Use	3.0
Existing Habitat Quality **Section 5.2.2**	Analysis for these weighting factors is not necessary for default procedures (see Section 2.1.3.2)		Poor **0.2**	Fair **0.6**	Good **1.0**	Excellent **1.5**	
Priority Area **Section 5.2.3**			Tertiary **0.1**	Secondary **0.5**	Primary **1.0**		
Existing Geo-morphic Integrity **Section 5.2.4**			Poor **0.2**	Fair **0.5**	Good **1.0**	Excellent **1.5**	
Existing Flood Plain Quality **Section 5.2.5.1**			Poor **0.2**	Fair **0.8**	Good **1.0**	Excellent **1.5**	
Impact Category **Section 5.2.6**			Minimal **0.2**	Moderate **1.0**	High **1.5**	Severe **2.0**	

To Calculate the mitigation credits required, sum all Impact Factor row values and enter the result in Box 1.	**Box 1. Sum of Impact Factors (I) =**	3.0
Enter the proposed length of stream to be impacted into Box 2.	**Box 2. Length of Impact (D) =**	1,310
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. **The value of Box 3 equals the total number of stream impact debits for the assessed impacts.**	**Box 3. Total Stream Impact Debits (I x D) =**	3,930

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Myers Mining (D-2014) Page: 3 of 4

Stream Segment: Long Creek Use Designation: WWH

Project Summary: Relocation of stream for following surface mining

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	Moderate **1.0**	Good **2.0**	Excellent **3.0**	2.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	Low **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.7
Riparian Restoration and Enhancement (Section 5.2.8)	None **0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.4
Resulting Aquatic Life Use (Section 5.2.1)	MWH or Class II PHWH **0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.6
Resulting Habitat Quality (Section 5.2.2)	Fair (Relocation Projects Only) **0.1**		Good **0.5**		Excellent **1.0**	0.5
Priority Area (Section 5.2.3)	Tertiary **0.0**		Secondary **0.1**		Primary **0.5**	0.0
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	Onsite **1.0**	1.0
Control (Section 5.2.10)	Deed Restriction **0.0**		Conservation Easement **0.3**		Fee Simple **0.5**	0.3
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			In-Kind **0.5**		0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	Schedule 4 **0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.0
Supplemental Water Quality Activities (Section 5.2.13)	None **0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	NA or Low **0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.0

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	6.0
Box 2. Mitigation Length (D) =	700
Box 3. Mitigation Credits (P x D) =	4,200

Ohio EPA 401 Water Quality Certification
Form B. STREAM MITIGATION WEIGHTING FACTORS

Project Name: Myers Mining (D-2014) Page: 4 of 4

Stream Segment: Unnamed Tributary to Long Creek (Trib. D) Use Designation: Class II PHWH

Project Summary: Relocation of stream for following surface mining

Circle appropriate response for each of the factors listed below and enter the numerical value in the column on the right.

Mitigation Factors	Options					Mitigation Factor Value
Stream Restoration/ Relocation Design (Section 5.2.7)	None (Preservation Only Projects) **0.0**	Minimal (Relocation Projects Only) **0.5**	**Moderate 1.0**	Good **2.0**	Excellent **3.0**	1.0
Riparian/ Floodplain Preservation (Section 5.2.5)	Minimal (Relocation Projects Only) **0.0**	**Low 0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.2
Riparian Restoration and Enhancement (Section 5.2.8)	**None 0.0**	Minimal **0.2**	Moderate **0.4**	Good **0.7**	Excellent **1.0**	0.0
Resulting Aquatic Life Use (Section 5.2.1)	**MWH or Class II PHWH 0.1**		WWH **0.6**	EWH **0.8**	CWH or Class III PHWH **1.0**	0.1
Resulting Habitat Quality (Section 5.2.2)	**Fair (Relocation Projects Only) 0.1**		Good **0.5**		Excellent **1.0**	0.1
Priority Area (Section 5.2.3)	**Tertiary 0.0**		Secondary **0.1**		Primary **0.5**	0.0
Watershed Location (Section 5.2.9)	Outside Watershed **0.0**	Within HUC 8 Digit Watershed **0.3**	Within HUC 11 Digit Watershed **0.5**	Within HUC 14 Digit Watershed **0.8**	**Onsite 1.0**	1.0
Control (Section 5.2.10)	Deed Restriction **0.0**		**Conservation Easement 0.3**		Fee Simple **0.5**	0.3
Impact/ Mitigation Relationship (Section 5.2.11)	Out-of-Kind **0.1**			**In-Kind 0.5**		0.5
Implementation Schedule (Section 5.2.12)	Schedule 5 **-0.1**	**Schedule 4 0.0**	Schedule 3 **0.1**	Schedule 2 **0.2**	Schedule 1 **0.3**	0.0
Supplemental Water Quality Activities (Section 5.2.13)	**None 0.0**	Moderate **0.1**	Good **0.2**		Excellent **0.3**	0.0
Threat to Stream Segment (section 5.2.14)	**NA or Low 0.0**	Moderate **0.1**	High **0.2**		Very High **0.3**	0.0

To calculate the preservation credits allocated, add all mitigation factor values in the right-hand column and enter the result in Box 1.
Enter the proposed length to be preserved into Box 2.
Multiply the values of Box 1 and Box 2 and enter the result in Box 3. The value in Box 3 equals the mitigation credits allocated for the assessed project. (Note: Preservation Credits can only equal 70% of the total mitigation credits required after the requirements of OAC 3745-1-05 are met.)

Box 1. Sum of Factor Values (P) =	3.2
Box 2. Mitigation Length (D) =	1,310
Box 3. Mitigation Credits (P x D) =	4,192

Ohio EPA 401 Water Quality Certification
Form C. STREAM IMPACT DEBIT AND MITIGATION CREDIT SUMMARY SHEET

Project Name: Myers Mining (D-2014) Page: 1 of 1

INSTRUCTIONS: this form is for use in tallying mitigation debits and credits for projects where multiple stream segments are either impacted or proposed as mitigation sites. This form is to be completed after the completion of individual adverse impact weighting factor scoring sheets (Form A) and stream mitigation weighting factor sheets (Form B) have been completed for the proposed project. Complete the tables below using the values from the individual Form A sheets and Form B sheets in order to summarize all computed stream impact debits and stream mitigation credits proposed for the project.

Adverse Impacts (Information from Form A sheets):

Stream Segment/ Project Name	Impact Weighting Factor Score (Form A, Box 1)	Linear Feet of Impact (Form A, Box 2)	Stream Impact Debits (Form A, Box 3)
1. Impound and relocate Long Creek	6.0	700	4,200
2. Relocate unnamed tributary to Long Creek	3.0	1,310	3,930
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Column Totals:		2,010	8,130

Stream Mitigation (Information from Form B or Form D sheets):

Stream Segment/ Project Name	Mitigation Weighting Factor Score (Form B, Box 1)	Linear Feet for Mitigation (Form B, Box 2)	Stream Mitigation Credits (Form B, Box 3 or Form D, Line 4)
1. Long Creek relocation	6.0	700	4,200
2. Unnamed trib. Long Creek relocation	3.2	1,310	4,192
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Column Totals:		2,010	8,392